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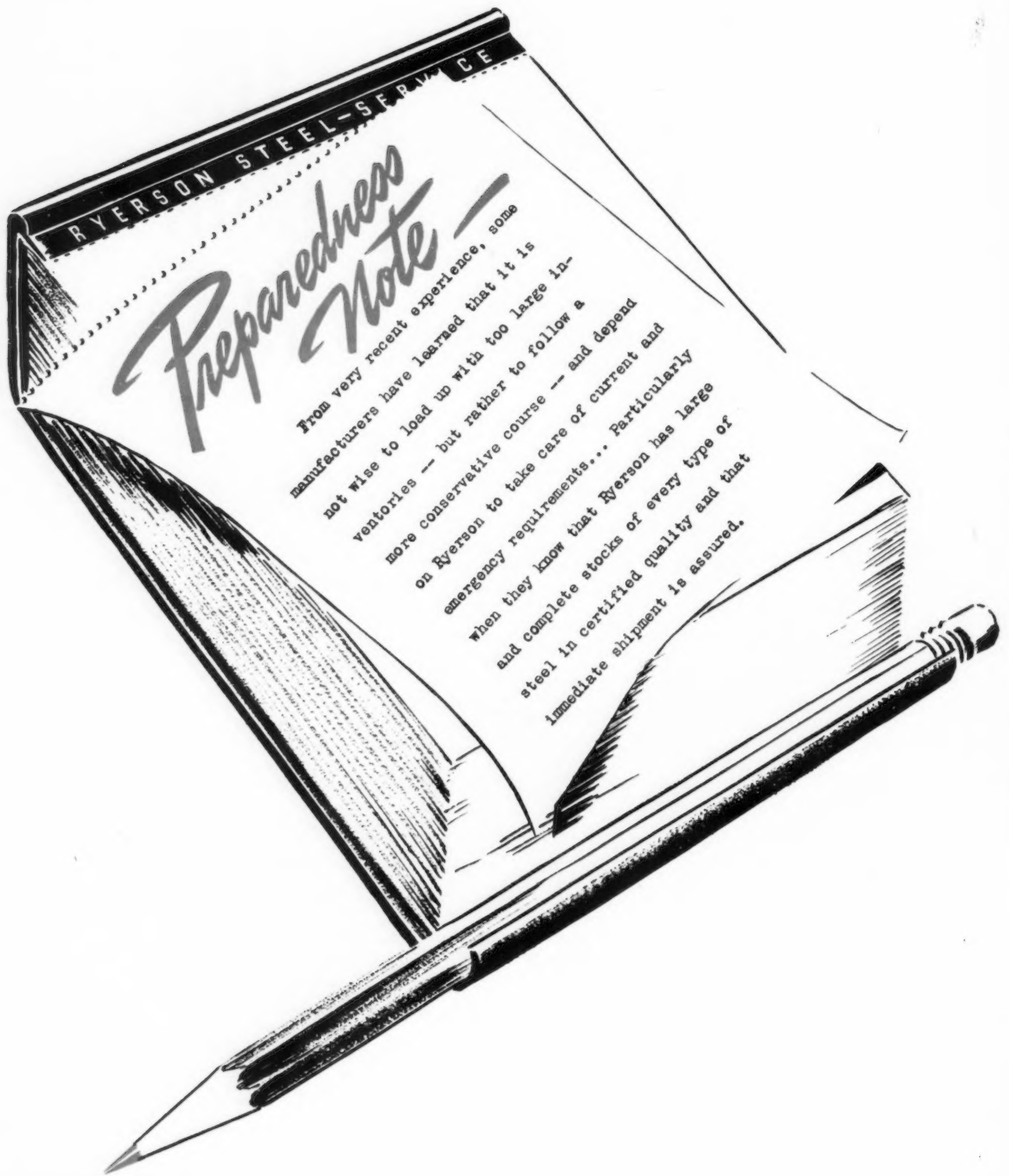
THE IRON AGE

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▲▲▲ THE IRON AGE ▲▲▲

FEBRUARY 15, 1940

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Vol. 145, No. 7

Futuristic Financing

THESE are some occupations, such as mining or well digging, where success is measured by one's ability to go further and further into the hole, but that is not true of financing.

Of course, in certain highly specialized fields, such as steel making or machine tools, sensitive in the extreme to business cycle fluctuations, a profit is not necessarily shown every year. The measure of success of concerns in such fields is not one year but the record of five, seven or ten. Capital goods industries in this respect are more mercurial in financial performance than consumer industries, which serve broader and more widely distributed demands. One's faith in the future of a steel company or a machinery builder that dipped into the red for two or three years under adverse business conditions would not necessarily be shaken if the concern had good management. A similar financial performance on the part of a service corporation such as an electric utility might indeed raise the question of soundness.

Take, for example, the case of a public service corporation which I will call the XYZ company. It furnishes a broad variety of essential consumer services to a very large and varied body of customers. It is a concern which has been in business for many years and which, prior to the depression and in spite of recurrent previous depressions, operated in black and made a profit three years out of four since 1865.

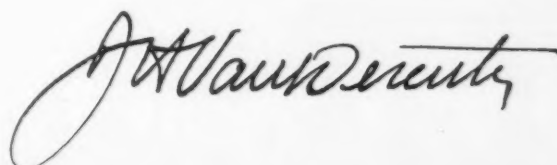
Here is the record for that company since 1933:

	Income	Outgo	Deficit
1933	\$2,079,697	\$5,142,954	\$3,063,257
1934	3,115,554	7,105,050	3,989,496
1935	3,790,046	7,375,825	3,585,779
1936	4,115,957	8,879,798	4,763,841
1937	5,293,840	8,105,159	2,811,319
1938	6,241,661	7,691,287	1,449,626
1939	5,667,824	9,268,338	3,600,514

A total deficit in seven years of \$23,263,832 as compared with a \$30,304,579 seven-year income.

What do you, as a business man, think of this performance? Would you say that the management of this corporation was satisfactory, or that it needed a change?

Multiply the figures by 1000 and you have the performance record of the United States Government under the New Deal. The record of the largest public utility in this country which manufactures and sells public service to its 130 million customers.





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COPPER STEELS

THE results of three-year atmospheric corrosion tests on 43 steels to determine the effect of copper on the corrosion resistance of plain and low-alloy steels.

By C. T. GREENIDGE and
C. H. LORIG

*Metallurgists, Battelle Memorial
Institute*

RESEARCH in this country and abroad (see bibliography at end of report) has shown that 0.10 to 0.40 per cent copper in plain carbon steel effectively reduces atmospheric corrosion, and service records confirm this beyond question. With the advent of the low-alloy high-strength steels, most of which are complex alloys, it became important to know the effect of copper in conjunction with other elements, and to know if its influence on corrosion resistance was in any way related to heat treatment. Three copper producers, Phelps Dodge Corp., Kennecott Copper Co. and Anaconda Copper Co., therefore sponsored a study at Battelle Memorial Institute of the effect of copper, alone and with other alloying elements, on the rust resistance of sheet steel.

The 43 steels (Table I) used for the corrosion tests were of the silicon-killed type, and were made as 15-lb. ingots from induction furnace melts.

They were hot rolled to sheet 0.040 in. thick and, after cleaning, cold rolled to a thickness of 0.033 in. Specimens of the sheet were tested in the as-rolled, the normalized, the normalized and drawn, the normalized and precipitation hardened, and the annealed conditions. The heat treatments given the sheet are described in the footnotes of Table II.

Atmospheric Corrosion Tests

Specimens for exposure to the atmosphere were of the size and shape shown in Fig. 1, which also illustrates the method of supporting the sheet for exposure. Before being put on exposure racks on the roof at Battelle each specimen was pickled, measured for size and weighed. The test was started in October, 1935, and was completed in 1938.

A total of five sets of specimens of each steel analysis and of each heat

treatment were tested, one set being removed from the racks at the end of each of the following periods: Six months, one year, one and one-half years, two years and three years.

After exposure the specimens were cleaned of rust electrolytically in a bath containing 10 per cent sodium cyanide, by using the specimens as cathodes and stainless steel sheets as anodes. Test runs on blank samples showed that iron losses in this method of cleaning were negligible in the time required to clean a specimen. The cleaned sheets were weighed and the final weights of the specimens deducted from the original weights to determine the weight loss resulting from oxidation in the air.

During exposure none of the sheets became perforated or ragged on the edges. Although all of the sheets pitted to some extent, no marked difference in the tendency toward pitting

was observed. No actual measurements of the depth or the frequency of pitting were made, however.

The results of the three-year corrosion study are summarized in Table I. The weight losses are expressed in milligrams per square centimeter of

surface exposed (both surfaces of the sheet being subjected to exposure) in order that weight losses for one steel may be readily compared with those of another. Since heat treatment had so small an influence on the corrosion losses, the weight losses of each steel

in the five conditions of heat treatment were averaged to obtain the values given in Table I.

The corrodibility rating values in the table express the weight lost by a steel in three years in percentage of the weight lost in the same period by

TABLE I
Average Weight Losses and Corrodibility Ratings for Copper Steels

Steel Compositions in Per Cent								3-Year Exposure		2-Year Exposure		1½-Year Exposure		1-Year Exposure		½-Year Exposure	
C	Mn	Si	P	Cu	Cr	Ni	Other Alloying Elements	Average Weight Loss, Mg. Per Sq. Cm.	Rating	Average Weight Loss, Mg. Per Sq. Cm.	Rating	Average Weight Loss, Mg. Per Sq. Cm.	Rating	Average Weight Loss, Mg. Per Sq. Cm.	Rating	Average Weight Loss, Mg. Per Sq. Cm.	Rating
0.02	0.02	0.15	0.02	(Base Iron)				120	100	91	100	72	100	58	100	30	100
0.02	0.02	0.15	0.02	0.20				80	67	64	70	50	69	41	72	22	73
0.02	0.02	0.15	0.02	0.50				77	64	63	69	49	68	40	70	22	73
0.02	0.02	0.15	0.02	0.75				74	62	63	69	49	68	40	70	20	67
0.02	0.02	0.15	0.02	1.25				74	62	63	69	50	70	41	71	22	73
0.02	0.02	0.15	0.02	2.00				72	60	62	68	51	71	42	72	22	73
0.10	0.30	0.15	0.02	0.40				76	63	63	69	48	67	40	70	22	73
0.25	0.30	0.15	0.02	0.40				74	62	62	68	48	67	39	68	22	73
0.10	0.30	0.15	0.02	1.25				70	58	59	65	47	65	32	64	21	70
0.02	0.02	0.15	0.02				0.10 Al (added)	95	79	77	85	61	84	49	85	28	93
0.02	0.02	0.15	0.02	0.40			0.10 Al (added)	75	62	62	68	48	66	39	67	22	73
0.02	0.02	0.15	0.02	0.40			0.20 Al (added)	74	62	60	66	46	64	37	65	22	73
0.02	0.02	0.15	0.02				0.20 Zn (added)	89	74	70	77	56	77	46	80	27	90
0.02	0.02	0.15	0.02	0.40			0.20 Zn (added)	77	64	62	68	49	68	39	68	23	77
0.02	0.02	0.15	0.02				0.20 Sn (added)	79	66	64	70	50	69	40	69	23	77
0.02	0.02	0.15	0.02	0.30			0.10 Sn (added)	76	63	61	67	48	67	39	67	22	73
0.02	0.02	0.10	0.02	0.40				75	62	62	68	49	68	39	67	22	73
0.02	0.02	0.30	0.02	0.40				77	64	63	69	50	69	40	69	23	73
0.02	0.02	0.60	0.02	0.40				78	65	63	69	49	68	38	67	23	77
0.02	0.02	0.15	0.02		0.40			81	68	65	71	51	70	42	73	24	80
0.02	0.02	0.15	0.02	0.40	0.40			73	61	59	65	47	65	39	68	22	73
0.02	0.02	0.15	0.02	1.25	0.40			69	57	59	65	48	66	39	68	22	73
0.02	0.02	0.15	0.02	0.40	0.40		0.20 Mo	68	57	56	62	45	62	37	64	21	70
0.02	0.02	0.15	0.02	1.25	0.40		0.20 Mo	68	57	57	63	46	64	38	66	21	70
0.10	0.30	0.75	0.02	0.50	1.00			51	43	44	48	38	52	30	53	20	67
0.10	0.30	0.75	0.15	1.10				58	48	49	54	41	57	33	56	21	70
0.10	0.30	0.75	0.15	1.10	0.50			46	38	42	46	35	49	28	49	19	63
0.10	0.30	0.75	0.15	1.10	1.00			44	37	39	43	35	49	27	47	19	63
0.10	0.30	0.75	0.15	1.10	1.50			41	34	35	39	32	44	25	44	19	63
0.10	0.30	0.75	0.25	0.50	1.00			37	31	35	39	31	43	25	44	19	63
0.09	0.31	0.61	0.14	0.03	0.96			57	48	50	55	43	59	34	59	24	80
0.09	0.29	0.61	0.14	0.31	0.96			42	35	37	41	32	45	26	46	19	63
0.07	0.25	0.61	0.14	0.52	0.96			41	34	37	41	33	45	26	45	19	63
0.08	0.22	0.69	0.14	0.61	0.96			41	34	36	40	32	44	26	45	19	63
0.09	0.27	0.69	0.14	0.72	0.96			43	36	38	42	33	46	27	47	19	63
0.08	0.21	0.69	0.14	0.82	0.96			42	35	37	41	33	45	26	45	19	63
0.09	0.25	0.69	0.14	0.96	0.96			43	36	38	42	33	45	27	47	20	67
0.09	0.25	0.72	0.14	1.03	0.96			44	37	37	41	33	45	26	44	18	60
0.08	0.24	0.72	0.14	1.09	0.96			43	36	37	41	33	46	27	46	19	63
0.09	0.24	0.72	0.14	1.23	0.96			43	36	38	42	33	46	27	47	19	63
0.10	0.28	0.72	0.14	1.35	0.96			45	37	38	42	34	47	27	47	19	63
0.09	0.26	0.72	0.14	1.40	0.96			44	37	42	46	34	46	26	46	18	60
0.11	0.29	0.71	0.14	1.49	0.96			46	38	39	43	34	47	26	45	19	63

Compositions of first 30 steels are nominal values. Sulphur contents of all steels under 0.03 per cent.

$$\text{Corrodibility Rating} = \frac{\text{Average Weight Loss of Steel}}{\text{Average Weight Loss for Base Iron}} \times 100$$

the base iron—an iron closely approximating ingot iron in carbon, manganese, phosphorus and sulphur contents. Thus a steel with a corrodibility rating of 75 lost only 75 per cent as much weight as did the base iron during a given period.

Atmospheric corrosion data for a few of the steels in the various conditions of heat treatment are given in Table II. They are typical of those obtained on practically all of the steels and are included merely to show that in these studies heat treatment had very little, if any, effect upon the rate at which the steel corroded.

the base iron, the 0.10 per cent Al iron, and the iron to which 0.20 per cent Zn was added during melting fall in a class in which the corrosion loss in three years is greater than 88 mg. per sq. cm. This loss is considerably above the losses sustained by the remaining steels over the same period. The second group—consisting of the simple alloyed steels not included in the first group, the binary alloyed steels having copper as one constituent, and two ternary alloyed steels containing nickel, molybdenum and copper—is moderately corrosion resistant, showing a loss in three years of from 68

the lower losses being obtained with the steels containing the largest number of alloying elements.

The data for steels containing 0 to 2.00 per cent of copper are plotted in Fig. 2 to show the effect of increasing amounts of copper on atmospheric corrosion of low-carbon steel. As the copper content increases to 0.20 per cent a sharp drop in weight loss occurs. With further increase in copper, the effect on atmospheric corrosion is small indeed. Although Daevs and the American Society for Testing Materials (see bibliography) did not test steels with as high percentages of copper as those reported here, their results also indicate optimum atmospheric corrosion resistance from additions of 0.25 to 0.50 per cent of copper.

Copper and nickel and combinations of copper, nickel and molybdenum had the effect on corrosion losses shown in Fig. 3. In retarding atmospheric corrosion, additions of nickel-copper and nickel-copper-molybdenum were but slightly more beneficial than copper alone. The corrosion resistance is often expressed in terms of the life of steel for a given weight loss. On this basis the life of the 0.40 per cent cop-

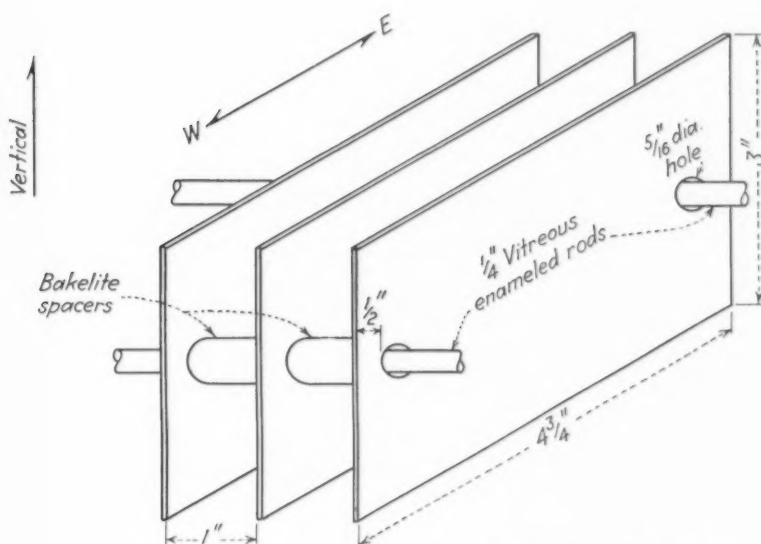


FIG. 1 — Method of supporting atmospheric corrosion specimens.

In Figs. 2 to 6 inclusive are plotted curves showing the effect of copper on the corrosion rate of some of the steels.

Discussion of Results

Small amounts of copper in alloyed as in unalloyed steels increase the resistance to atmospheric corrosion. The improvement in corrosion resistance due to copper is not always the same in the low-alloy steels, since the individual influences of two or more alloying elements on corrosion are seldom additive. It is evident that moderate amounts of nickel, tin and aluminum, for example, add to the corrosion resistance of low-carbon steel when used individually, yet when these elements are combined with copper they add little to the resistance that is obtained from the copper alone.

The steels of Table I fall into three groups with respect to their resistance to corrosion. One group consisting of

to 81 mg. per sq. cm. It is definitely less resistant than the third group made up of the high silicon steels containing either copper and phosphorus, phosphorus and chromium, copper and chromium, or copper, phosphorus and chromium. In this group the corrosion loss after three years' exposure ranged from 37 to 58 mg. per sq. cm.,

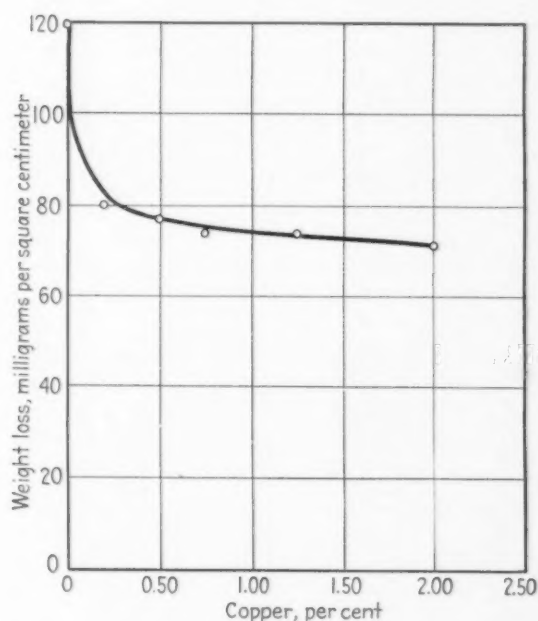


FIG. 2—Effect of copper on corrosion of low carbon steels exposed to the atmosphere for three years.

per steel for a weight loss of 75 mg. per sq. cm. is twice that of the base iron.

No worth while improvements in atmospheric corrosion resistance of copper-bearing steels were obtained from alloying them with aluminum, silicon, tin, or zinc (according to chemical analysis only a trace of zinc was re-

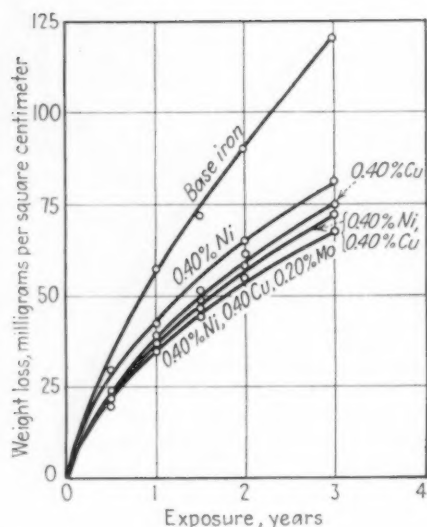


FIG. 3—Effect of nickel, molybdenum and copper on the atmospheric corrosion of low carbon steel.

tained in the steel). Fig. 4 shows that no benefit was derived from adding up to 1.0 per cent silicon to steels containing 0.40 per cent copper.

The upper curve of Fig. 5 is for a low (0.03 per cent) copper steel containing 0.09 per cent C, 0.31 Mn, 0.14 P, 0.61 Si and 0.96 Cr; the lower curve is for the same steel but containing 0.31 per cent copper. At a weight loss of 42 mg. per sq. cm. the life of the 0.31 per cent copper steel was twice that for the steel with 0.03 per cent copper. According to this method of comparison, the addition of

copper appears to double the life of the alloyed steel just as it does the life of the base iron. No important change in corrosion resistance was effected upon raising the copper content of the alloy steel from 0.31 to 1.49 per cent.

Both chromium and phosphorus are likewise effective in promoting corrosion resistance in the copper-bearing, silicon steel of the type dealt with in Fig. 5, as is shown in Fig. 6. The curve in Fig. 6 for the copper-silicon steel low in phosphorus and containing no chromium showed that this steel corroded at the same rate as the 0.40 per cent copper iron shown in Fig. 3. Upon adding 1.00 per cent chromium to the copper-silicon steel the weight loss diminished to 50 mg. per sq. cm. after three years' exposure, a value reached by the copper-silicon steel in one and one-half years. In this instance the time required for a given weight loss was doubled by an addition of 1 per cent of chromium. Under similar conditions of exposure that is not always the case with chromium, for in some of the low-alloy steels, particularly those of low silicon content, the effect of chromium up to 1.00 per cent on atmospheric corrosion resistance is negligible.

An increase in phosphorus content from 0.02 to 0.14 per cent in the copper-silicon-chromium steel markedly improved the corrosion resistance, almost doubling the time required for a weight loss of 41 mg. per sq. cm. The rate of corrosion was further decreased by raising the phosphorus content to 0.25 per cent. The effect of

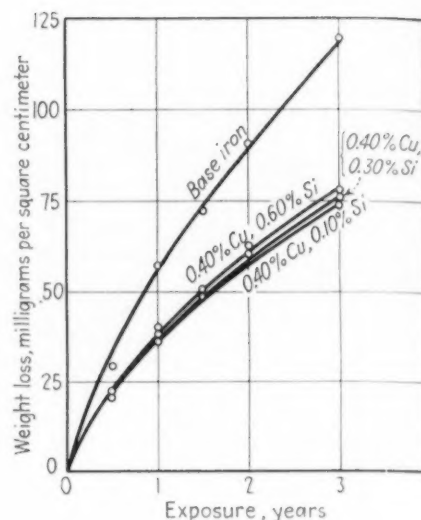


FIG. 4—Effect of silicon on the atmospheric corrosion resistance of copper-bearing steels.

raising the phosphorus content from 0.14 to 0.25 per cent, however, was less than that obtained by raising the phosphorus content from 0.02 to 0.14 per cent.

Summary

(1) Three-year atmospheric corrosion tests were conducted on 43 steels to determine the effect of copper on the corrosion resistance of plain and low-alloy steels.

(2) The corrosion resistance of low-carbon and low-alloy steels was markedly improved by the addition of

TABLE
Atmospheric Corrosion Data from Copper-Bearing

Chemical Composition, Per Cent					Weight Loss in Milligrams per Square Centimeter of Surface Exposed									
C	P	Si	Cu	Other Alloys	As-Rolled					Annealed				
					½ Yr.	1 Yr.	1½ Yr.	2 Yrs.	3 Yrs.	½ Yr.	1 Yr.	1½ Yr.	2 Yrs.	3 Yrs.
0.02	0.02	0.15			33.1	58.1	72.2	91.1	109.8	27.8	53.4	66.8	98.9	131.0
0.02	0.02	0.15	0.20		22.9	41.6	51.0	65.7	80.0	21.4	39.2	48.7	64.6	80.7
0.02	0.02	0.15	0.50		23.1	40.1	50.0	64.7	76.6	21.2	39.3	48.2	62.0	77.2
0.02	0.02	0.15	1.25		18.1	41.3	52.8	65.5	77.0	21.0	38.3	46.8	60.1	73.0
0.02	0.02	0.15		Ni 0.40	25.6	43.7	52.6	68.4	81.4	22.1	38.8	49.1	62.4	80.5
0.02	0.02	0.15	0.40	Ni 0.40, Mo 0.20	21.1	38.0	45.9	57.2	67.2	20.0	36.3	45.2	53.4	66.3
0.10	0.02	0.75	0.50	Cr 1.00	20.9	30.9	38.1	45.0	50.0	19.6	29.1	37.4	44.8	52.5
0.10	0.15	0.75	1.10	Cr 0.50	19.0	29.2	35.3	41.6	48.7	18.5	27.5	33.3	38.9	43.2
0.09	0.14	0.61	0.31	Cr 0.96	18.6	25.8	31.2	35.5	42.5	18.1	26.3	30.4	34.0	40.5

Notes on Heat Treatments:

As-rolled = no heat treatment given sheets after rolling.

Annealed = the low phosphorus steels were box annealed at 1650 deg. F. The steels containing 0.14 per cent or more of P were box annealed at 1800 deg. F.

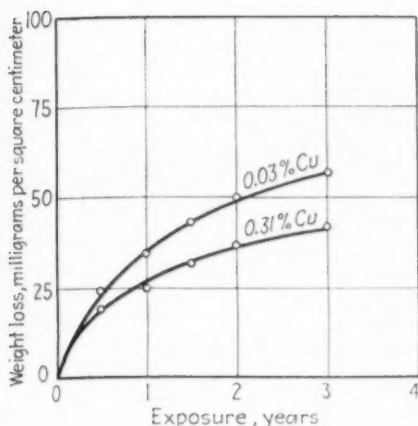


FIG. 5—Effect of copper on the atmospheric corrosion resistance of steel containing 0.09 per cent carbon, 0.14 per cent phosphorus, 0.61 per cent silicon and 0.96 per cent chromium.

0.20 to 0.50 per cent copper. While higher copper contents increased the resistance to atmospheric corrosion still further, the improvement was small.

(3) Copper was effective in increasing the corrosion resistance of silicon-chromium-phosphorus steels. In these steels as well as in plain low-carbon steels, 0.20 to 0.50 per cent copper appeared to double the life of the steel.

(4) Chromium and phosphorus were likewise effective in reducing the

rate of corrosion of the copper-silicon steels.

(5) Small amounts of tin, aluminum, nickel or silicon in copper-bearing, low-carbon steel had little effect on its corrosion resistance.

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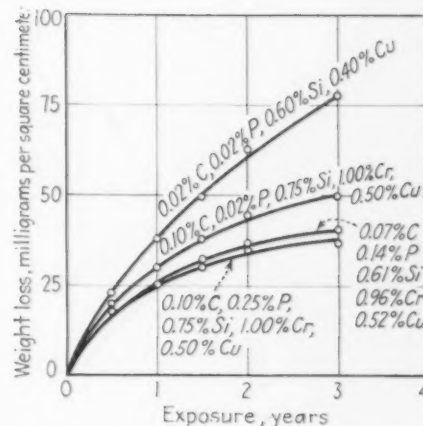


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II

Steels Exposed at Battelle Memorial Institute

Weight Loss in Milligrams per Square Centimeter of Surface Exposed

Normalized					Normalized and Drawn					Normalized and Precipitation Hardened				
½ Yr.	1 Yr.	1½ Yr.	2 Yrs.	3 Yrs.	½ Yr.	1 Yr.	1½ Yr.	2 Yrs.	3 Yrs.	½ Yr.	1 Yr.	1½ Yr.	2 Yrs.	3 Yrs.
30.3	57.5	67.6	88.3	112.0	28.7	61.1	71.9	84.4	114.5	30.6	58.6	82.9	95.2	134.5
22.7	41.2	50.2	64.4	77.6	22.4	42.8	48.9	61.7	80.0	22.8	42.2	51.7	64.0	82.9
22.5	39.7	48.2	61.4	74.2	22.4	41.6	49.3	60.9	77.1	22.7	40.7	50.8	63.8	78.5
23.0	40.6	50.2	62.5	73.8	22.5	42.3	49.5	61.2	75.2	23.7	41.6	53.4	63.4	73.0
24.3	41.5	50.9	67.8	79.7	23.2	42.7	50.1	62.7	80.4	24.9	43.6	51.9	65.3	81.6
20.9	36.1	44.4	56.8	68.2	20.6	38.2	45.0	54.2	68.6	21.7	37.2	42.7	58.5	67.7
20.6	31.2	38.2	43.8	50.3	20.9	31.2	37.9	44.3	50.5	20.6	29.9	36.7	43.9	51.9
19.4	29.1	35.3	42.7	42.3	20.4	26.5	36.7	41.8	46.0	19.4	29.1	35.8	42.2	48.2
19.1	29.0	33.6	40.2	41.8	20.2	24.6	34.5	38.4	42.9	19.5	26.7	32.8	38.4	41.9

Normalized = steels containing 0.02 per cent P were heated to 1650 deg. F. and then cooled in air. Steels containing 0.14 per cent or more of P were heated to 1800 deg. F. and then cooled in air.

Normalized and drawn = Steels which had been normalized as described above were drawn at 1250 deg. F. for 4 hr.

Normalized and precipitation hardened = Steels which had been normalized as described above were reheated to 930 deg. F. for 3 hr. to effect precipitation hardening.

AIR CONDITIONING FOR AIRCRAFT ENGINES

AN interesting tooling set-up for precision work and the adoption of new type fluorescent lighting on a very large scale are two features of the new Indianapolis plant of the Allison division of General Motors Corp., where aircraft engines for the U. S. Army will be produced in larger quantities than heretofore practicable. The main manufacturing plant is windowless and is completely air conditioned for control of temperature, humidity and dust, all of which affect workmen and machines. The buildings were designed by the Austin Co., Cleveland, and welded construction of columns and trusses is used throughout.

Putting on a production basis the various models of the Allison engine, which require a high degree of precision workmanship on highly finished parts of alloy steels and aluminum alloys, was accomplished by adapting existing machine tools, developing new fixtures for existing machines, or by the development of entirely new machines.

The milling machines include Hydrotels, hydraulically operated with the latest type of controls for maintaining mechanical dimensions both for diameters, irregular shapes and contours and producing a finish to profilometer measurements.

Some of the larger vertical drilling machines are specially designed. One machine has a 10-in. hydraulic cylinder and the work is chucked in the vertical position and rotated around a drill $4\frac{5}{32}$ in. in diameter and 44 in. long. This drill, mounted vertically and stationary on the base of the machine, will drill to a depth of 22 in. in alloy steel forgings used for propeller shafts.

A battery of screw machines of various makes includes Fastermatics for straight boring and turning and straight and contour facing.

The internal grinding machines for some of the parts are of special design and are the result of several years of experimental development and are the first of this type to be used for production.

In the multiple spindle drilling equipment there are a number of larger machines that drill as many as 57 holes of various diameters and depths in one operation.

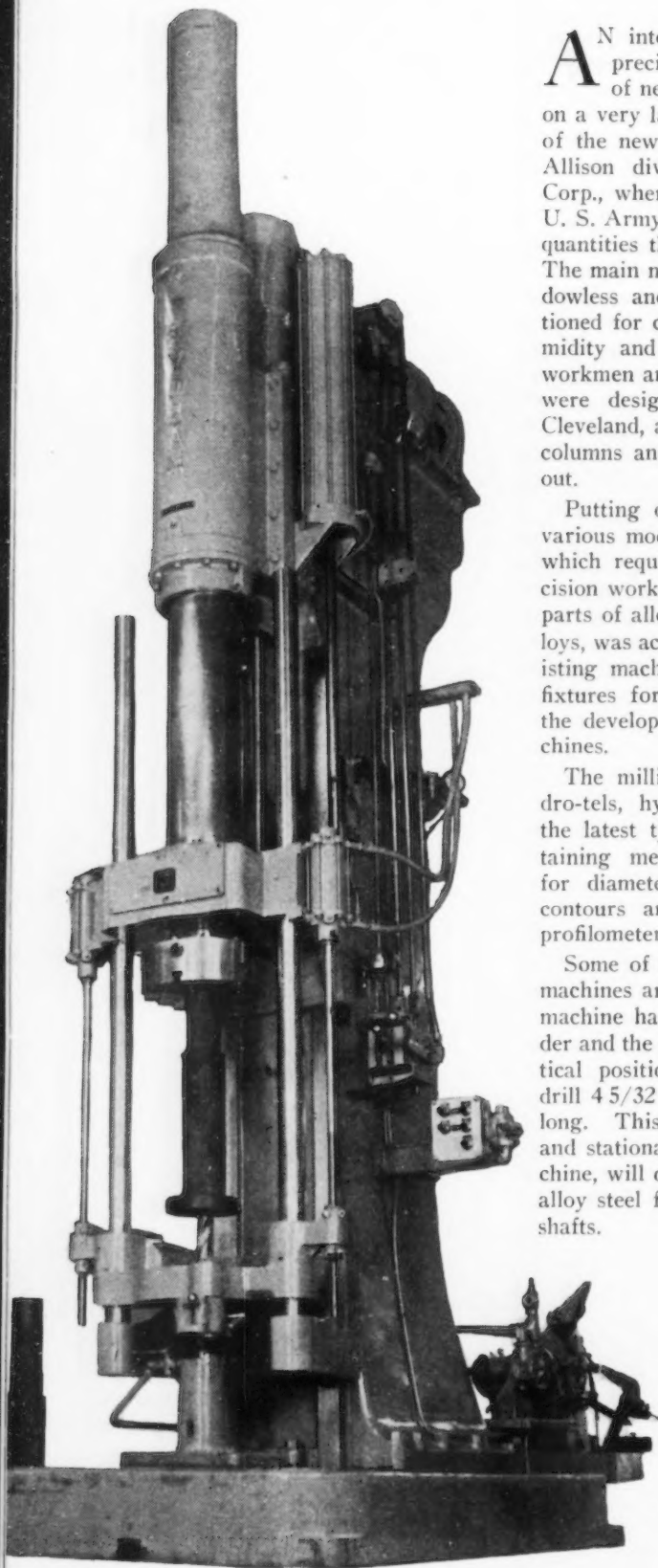
The heat treating section is located in the center of the building. Furnaces are all electrically heated and have atmosphere control. The panel board containing all instruments is arranged at one end of the room, visible from any spot in the department. The furnaces are sunken into the floor, their bottoms extending into a basement. The Homocarb and Vapocarb furnaces are so arranged that they are convenient to the quench tank and panel board.

In addition to anodizing, plating and dichromating equipment there is also a complete installation for bright cadmium, nickel, copper and chrome plating.

The assembly floor has a sub-assembly department preceding it which is located at the end of the finish store stocks and the whole scheme of the layout in the plant is of a progressive type. The parts enter at one end and pass through the machining department to the final inspection and then into the finish stores, through to the sub-assembly and are picked off in the assembly line along the departments to the completed motor. Thence the motor goes to the test stands.

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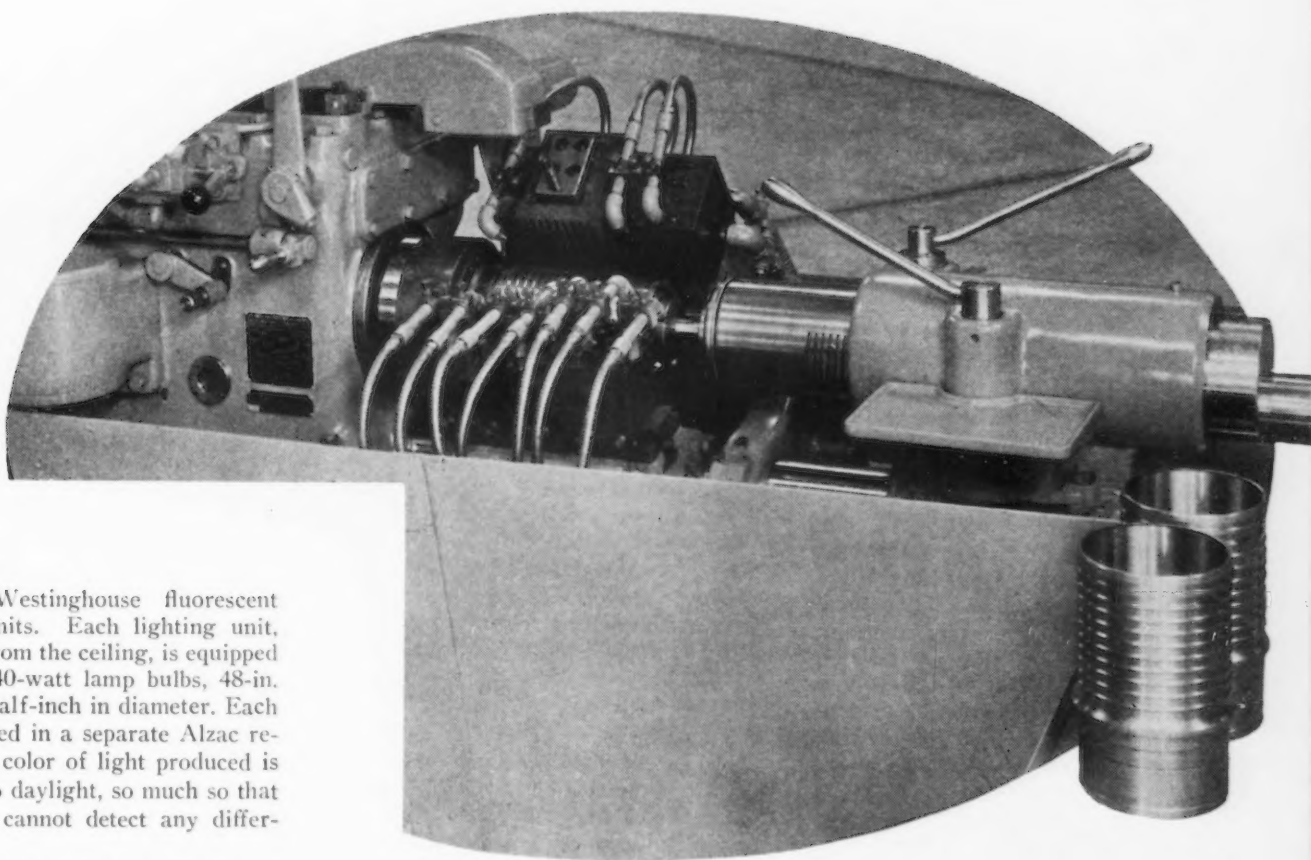
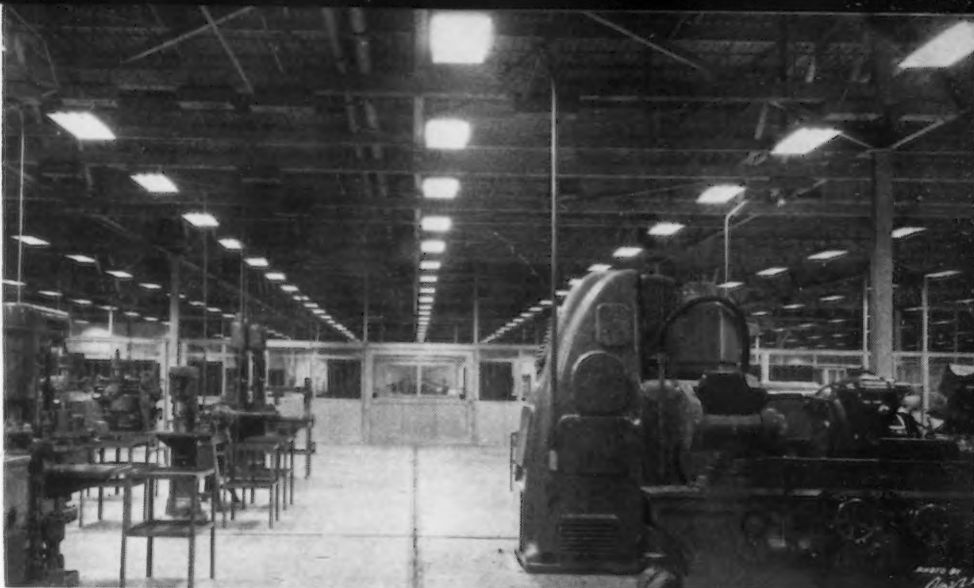
BARNES HYDRAM (left) drills a deep hole in a hardened steel shaft in $\frac{1}{2}$ hr., an operation previously requiring several hours. Interior view (opposite top) of new Allison Indianapolis plant for U. S. Army airplane engines. Note the new type of fluorescent lighting. The automatic lathe (opposite, center) machines all fins and shoulders on the outside of a cylinder barrel in one operation. In the heat treating department (opposite, bottom), the furnaces and cooling tanks are half sunken through floor to facilitate handling of work.



For the promotion of greater workman comfort and health and better precision work the forging and casting cleaning is equipped with a new arrangement for drawing off metal dust. The workmen sit at long metal tables upon which the machinery is placed. A slot is located along the front edge of this table. A central blower sucks all small metal particles across the table surface down into tubes to a central exhaust pipe from which the dust is expelled at a point where it can do no harm.

Since the slots on the tables are directly below the workman's face and at about the level of his waist, the suction also draws fresh, clean air down to the workman.

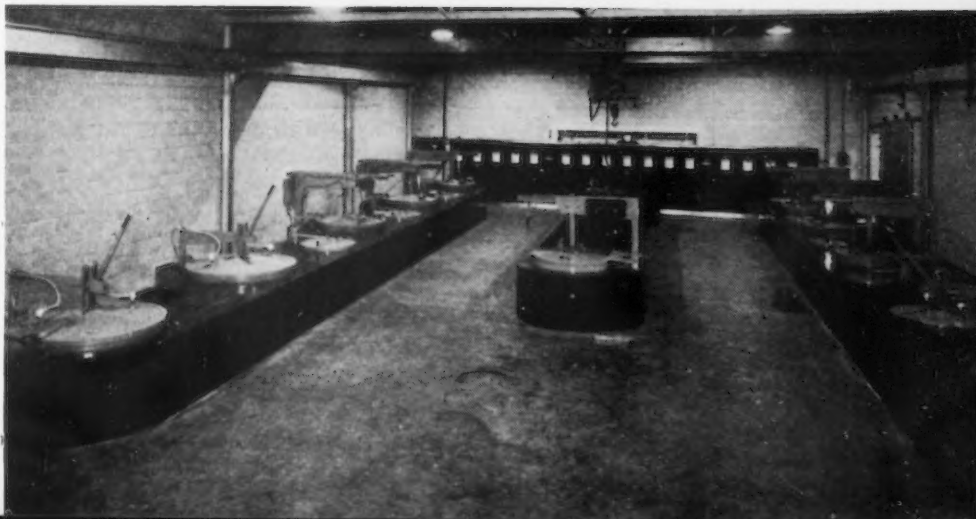
The factory is lighted with newly



developed Westinghouse fluorescent industrial units. Each lighting unit, suspended from the ceiling, is equipped with three 40-watt lamp bulbs, 48-in. long and a half-inch in diameter. Each bulb is housed in a separate Alzac reflector. The color of light produced is very close to daylight, so much so that the layman cannot detect any difference.

The Westinghouse lighting units are installed on a 12½-ft. by 13-ft. spacing mounted 14 ft. 6 in. above the floor. The average illumination obtained is 28 to 30 footcandles.

The air conditioning equipment is housed in four penthouses on the roof. The equipment is divided into eight independent units, each capable of providing 52,000 cu. ft. of air per min. Because of the unique combination of factors in heat insulation, air conditioning and artificial lighting, it will take relatively less power to create this new approach to ideal working conditions than in previous attempts.



... PROTECTING STEEL

AS a result of the experimental work of the Corrosion Committees (British), the Protective Coatings Sub-Committee has drawn up a complete and concise statement of the best methods of painting iron and steel structures for protection against atmospheric corrosion. The main points are,

(1) All the material should be thoroughly descaled prior to the application of the first priming coat of paint.

(2) Descaling should be carried out by sand or shot blasting or by some kindred process, or alternatively by pickling. Exposure to weathering, for however long a period, followed by hand cleaning is not recommended, except in special cases.

(3) If pickling is adopted, the duplex method, including a finishing dip in dilute phosphoric acid, is probably the best.

As regards descaling, two general principles should be borne in mind. The descaling process should take place as late in the fabricating process as practicable. Due precaution should be taken to keep the material reasonably free from rust prior to descaling, and the application of the priming coat of paint should follow immediately after the descaling process and should take place under good conditions. A reasonable drying time should also be allowed.

The first point arising from these specifications, is that it is essential to remove the rolling scale completely before starting to paint. The only alternative to this is painting over the rolling scale. For reasons that will be discussed later, the latter method can only be expected to be successful if the rolling scale is intact. This at once presents difficulties. It is true that in certain cases, such as sheets which are rolled in packs and therefore protected to a large extent from oxidation, it

By J. C. HUDSON

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might be possible by dipping the material in paint or oil, as soon as the packs are broken up, to ensure that the protective coating is applied to an intact and thin rolling scale. As a general rule, however, it would not be practicable to keep an intact rolling scale on iron and steel before painting it.

Let it be assumed, however, that this is done, as was indeed approximately the case in the tests of the Corrosion Committee. What happens? The tests showed that the rolling scale simply flaked off bodily over large areas and took the paint with it. It has to be admitted that at some of the corrosion stations, good results have been obtained on paint applied over the rolling scale on mild steel. For example, at Motherwell, specimens of this type are still in good condition after eight years exposure. This is equally true, however, of specimens that were pickled before painting, and it is expected that the latter will prove to have the longer life eventually.

It has been suggested, in order to avoid the possible damage to the rolling scale and rusting of the surface in fabrication, that structural steelwork should be painted or coated with linseed oil while still hot after leaving the rolling mill. This procedure has been tried, and again speaking in general terms, it is not considered an adequate substitute for descaling, at least with present methods of production. The scale is left in position under the paint film, and although this film is one coat thicker, this fact must ultimately lead to failure of the same type as that already mentioned.

This process would be limited for large scale application by the fact that certain types of scale are not suitable for painting. Some are friable and brittle and the paint would flake off very easily with them. Moreover, the

presence of paint on a finished section or plate is a nuisance in the course of fabrication. For instance, it has to be scraped off locally if any welding has to be done. Finally, damage is always likely to occur to the painted surface in handling, fabrication and transit. To sum up, the procedure of painting metal while hot at the rolling mill is not regarded as a generally satisfactory substitute for the methods recommended by the Protective Coatings Sub-Committee.

Weathering Is Condemned

The second point is that pickling or sandblasting is specified as the method of descaling, and weathering, that is, exposure to rusting until the scale falls off, is condemned. What are the reasons for this? First of all the weathering process cannot be controlled. It is unreliable and no one can guarantee to remove scale completely by means of it. Thus, the rate of descaling of steel in the atmosphere depends on the type of scale, which in turn varies with the temperature and other conditions of rolling.

Although the detailed connection between the rolling temperature and the structure of the scale is not yet known, it is certain that some types of scales are much more resistant to weathering than others. In the case of steel, for example, the reddish low-temperature scales are more difficult to remove than the bluer ones formed at normal rolling temperatures. At least, Winterbottom and Reed showed that they were much less readily removed by acid pickling baths. The reason for this is that the rolling scale on ferrous metals consists of several different oxides arranged roughly in layers. The larger of these, which constitutes over 80 per cent of the total thickness, consists of ferrous oxide. The thinner, whiter layer includes two strata of magnetite and ferric oxide respectively. The relative proportions of the three oxides vary according to the conditions of rolling, and have an effect on the properties of the scale and its resistance to weathering.

*In the United States, the new method of flame descaling is considered as being extremely successful. See article "Iron and Steel Descaled and Structural Steel Cleaned and Dehydrated by Oxy-acetylene Process," in April 20, 1939, issue of THE IRON AGE.

AGAINST CORROSION . . .

It has also to be remembered that the rate of descaling depends on the climatic conditions. It is obvious, for example, that during a heat wave in summer, very little descaling will occur at all. The practical consequences of these considerations is that in the case of a large structure assembled on the site from a large number of different steel components, which are erected at different dates and exposed to the weather to differing degrees, complete descaling by weathering can only be realized when the structure is left unprotected for an excessively long time—by this is meant a period of several years. This would obviously do more harm than good, since many parts of the structure would have been excessively corroded by then and might even require replacing.

However, let it be assumed that by some means or other, a contractor has succeeded in removing the scale entirely from structural steelwork by exposure to the weather. Has he then an ideal surface for painting? The answer again is no. Why? Because the removal of the rolling scale has only been achieved by permitting considerable rusting to occur.

In fact, the experimental work of the Committee has shown that the amount of rust remaining on a steel surface entirely descaled in this way is equal in weight to the original rolling scale, even after a very efficient scratch brushing. The net result of the process has thus been to replace the oxides of iron in the rolling scale by an equal weight of the corresponding hydroxides, which are the constituents of rust. It is true that these hydroxides of iron may be more firmly attached to the steel surface and therefore, less likely to flake off bodily from it than the rolling scale they replace. If the rust particles were truly neutral bodies, they might indeed, be incorporated in the oil of the paint applied to the surface and simply act as additional pigment. Unhappily, this is not the case, and the fact is that the rust is unstable, with the result that blisters form be-

neath any paint film applied over a rusted surface.

Why do these blisters form? The writer's own view is this. It has been established by Palmaer and others that rust not only consists of various hydroxides of iron, but that, under normal circumstances, these hydroxides are arranged in strata which may be

THE chairman of the Protective Coatings Subcommittee of the Corrosion Committee (British) herein explains the findings and the reasons for the findings of the committee. These data, first presented before the Midland Metallurgical Societies, explain the necessity of descaling steel prior to painting, methods of descaling, and types of paints to use to assure maximum life of steel structures.

presumed to be in equilibrium with each other. The effect of scratch brushing after weathering is to expose the innermost layers of rust, which are not in equilibrium with the atmosphere. Although this rust is sealed at first from the atmosphere by the paint film, moisture and oxygen soon diffuse through the film and react with the rust, giving rise to swelling of the rust and blistering. It is therefore legitimate to attribute this blistering to the presence of the rust, but it would be misleading if it were implied that this type of blistering invariably leads to immediate failure of the paint film. If the paint is sufficiently tough and elastic, failure may not occur, at least for some time. For practical purposes, however, this consideration may be dismissed, because no structural steel work is ever completely descaled by this means. The evil effect of the blistering as accentuated by the presence of remaining pieces of rolling

scale and the swelling of the rust, or the continuation of the rusting process, drives a wedge between the metal and the rolling scale, forcing off the scale and the paint with it. This is obvious.

To sum up the remarks of this section: It may be concluded that descaling is essential and that weathering will not do. The benefit of descaling may be illustrated by some simple tests that have been made on some small wrought iron specimens that have now been exposed for more than seven years. Seven of the specimens were pickled, the remainder were exposed to the weather for six weeks and then cleaned by hand in various ways. The present position is that the paint has not failed on 6 of the 42 specimens originally exposed and all these 6 specimens were pickled before painting. The net result is that the average life of two coats of paint on pickled wrought iron has exceeded seven years, as compared with 2.1 years for wrought iron that had been partially descaled by weathering and cleaned by hand.

Methods of Descaling

The next question to be considered is how best can descaling be carried out. The obvious answer is that the most convenient and cheapest method that will give the required result should be used. In practice, the choice lies between pickling and various forms of sandblasting.* Pickling can only be carried out in the shop, but sandblasting can also be practised in the field. For instance, it would not be possible to pickle the underside of a railway bridge, but it could be sandblasted.

As regards the results obtained, there is little to choose between the two processes. In the tests of the Corrosion Committee, a slight advantage has been observed in favor of sandblasting, as compared with pickling in ordinary sulphuric acid, but this advantage is so small as to be of no practical importance. It is, however, desirable to compare the results obtained by different methods of descaling, even if this should only estab-

lish that there is no essential difference between them. A series of tests has therefore been conducted in which the methods of pickling include hydrochloric, phosphoric and sulphuric acid baths and electrolytic pickling. Methods of mechanical descaling include sandblasting, shotblasting and grinding. In addition, specimens exposed to the weather for various periods and cleaned by hand have been exposed.

The finishing treatments after pickling have also been varied. Some specimens were simply washed in hot water, others were immersed in lime water solution, while a third set was treated with a phosphoric acid wash of the type which will be discussed later. Pending the results of these tests, the Protective Coatings Subcommittee has recommended the adoption of the duplex process of descaling steel by pickling introduced by Dr. H. B. Footner. In essentials, this process combines a simple chemical surface treatment with the descaling process.

It is generally known that certain surface films of metals have protective properties. In the case of iron, a natural oxide film forms when the bare metal has access to air. Even this film manifests feeble protective properties under certain conditions and, as is known, when its properties are modified as a result of alloying the steel with about 14 per cent of chromium, it will withstand corrosion satisfactorily in a large number of media.

Films of iron phosphate are also resistant to corrosion, and this fact forms the basis of the proprietary phosphating process, of which Bonderizing and Parkerizing are the best known examples. The films formed in these processes are, however, complex phosphates containing other metals such as manganese. Although they do not suffice to protect the metal entirely by themselves, they are an excellent basis for paint and enamel and have a wide range of usefulness.

The film formed on iron or steel when immersed in or rubbed with a simple solution of phosphoric acid, although much thinner than the films produced by the proprietary processes, still has valuable protective properties. The first attempts to produce this film on structural steel involved descaling the steel in phosphoric acid itself. This was a costly method of removing the rolling scale, although methods of recovering the acid were worked out later. Moreover, there were technical difficulties associated with the fact that undesirable deposits of complex phosphates were produced after the bath

had been in use for some time. These difficulties have been overcome by the Footner process in which the metal is descaled in a dilute sulphuric acid bath as before, then rinsed in a water bath and finally transferred for a few minutes to a hot 2 per cent solution at 185 deg. F. On removing the steel from the dilute phosphoric acid bath, it is allowed to dry by its own heat and painted as soon as it is dry. Footner used a red lead and graphite primer for this purpose. The process has the obvious advantage that the use of large quantities of expensive phosphoric acid is avoided. Consequently the cost is low and, according to Footner, rather less than $\frac{3}{4}$ d. (about 1.5c.) per sq. ft. of plate. Moreover, it has the great merit of being foolproof, since no traces of noxious acid are left on the plate.

Panel Wash Used

In view of what has already been said concerning the damaging effect of rust beneath a paint film, the principle that steel work should be painted immediately after descaling should be accepted by everyone. This is not always practicable, however, and in such cases the so-called panel wash may be of service. There are several commercial brands of panel wash on the market. Their main field of usefulness is for application to steel that has become slightly rusty after descaling. For instance, the London, Midland & Scottish Railway Co., uses a panel wash of its own, which is applied to the steel panels used for car construction. These panels are, however, pickled by specification at the works of origin and the panel wash merely removes the effects of any slight rusting which occurred during the process of fabrication.

It should be made clear that no existing panel wash is capable of overcoming the deleterious effect of gross rusting or of non-intact rolling scale beneath paint applied to a steel surface. This view was held a few years ago by some of our friends in America, who, after they had been remonstrated with gently by correspondence and told that in our view descaling was the correct procedure, they eventually wrote to say that practical experience had proved that our view was correct. They are now advocating sandblasting combined, as we agreed very properly, with the use of a panel wash on the descaled metal. It is, of course, very desirable to devise a panel wash that would be capable of dealing with heavily rusted stock, and research to this end is being conducted in at least one quarter.

Having prepared the surface, the next thing to do is to choose the paint, and the first point is that the primer should be an inhibitive paint. What is meant by this? Broadly a paint that tends to prevent steel from rusting as a result of chemical action on its surface. This is in distinction to neutral or excluding paints which merely protect the metal by hindering the ingress of moisture and oxygen. It is not fully known how inhibitive paints work, but for practical purposes the lack of this knowledge is not essential. It can be imagined that the presence of the pigment in the paint strengthens the natural oxide film on the metal. This is clearly a reasonable assumption in the case of chromate pigments or of pigments with an alkaline reaction. Whatever the explanation may be, there is no doubt that inhibitive primers give superior results.

Choosing a Paint

The choice of finishing paints is not, on the whole, so important as that of the priming coat, and paints of good quality are roughly equivalent. This may be seen, for instance from the following facts namely, the average life of paint systems using finishing coats of red oxide iron paint was 3.8 years, that of micaceous iron ore and aluminum was 3.7 years, and in the case of two of the other paints the life exceeded 3.2 years. It will, however, be noted that red oxide of iron heads the list and, although this has not invariably been the case, it may be taken that well formulated red oxide of iron of good quality forms a very satisfactory finishing paint and that it is difficult to improve upon it. At the same time, there is no doubt that there is room for material improvement in the properties of paints themselves, and it is probable that these will be achieved by the introduction of synthetic resinoids and other modifications of the paint vehicle.

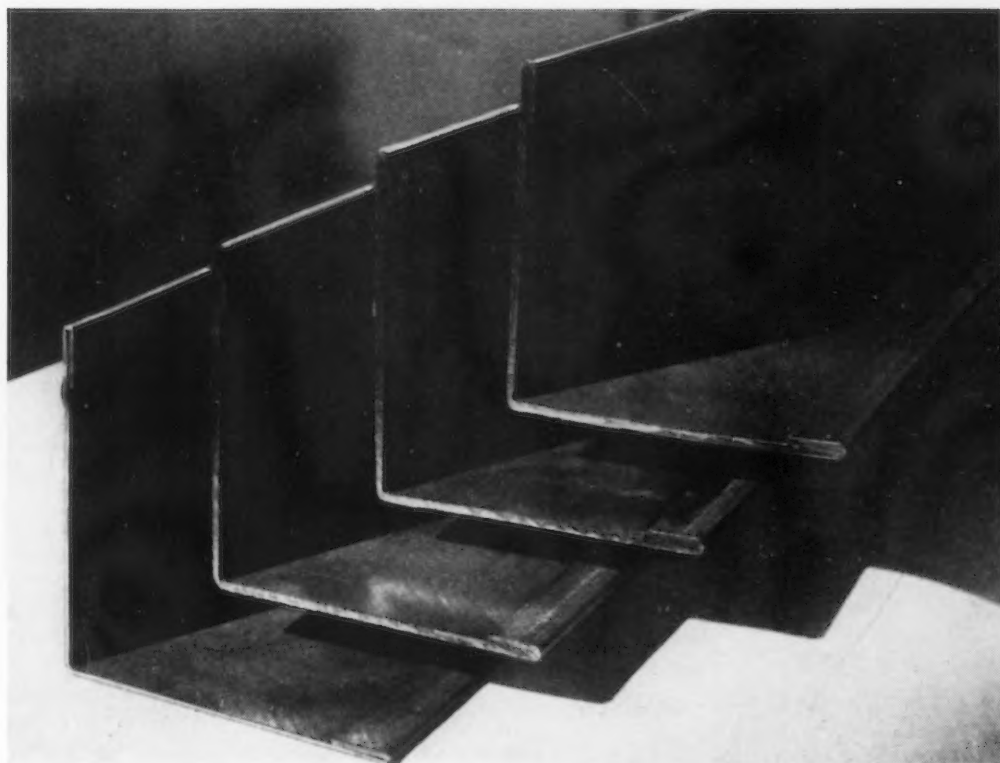
A perfectly logical question for the practical man to ask would be the following—we know that it has been established that when exposed to atmospheric corrosion in the bare condition, certain low-alloy steels containing copper or copper and chromium are appreciably more resistant to corrosion than ordinary steel. Is this superiority manifested in the protected condition? In other words, if the user has to keep structures painted, is it worth while to pay the additional cost of constructing them of low-alloy steel?

It is difficult to give a precise answer to this, but on the basis of the experimental data obtained, the answer

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FOR proper protection of steel, descaling is essential and weathering will not do. To descale, the British recommend pickling and various forms of sand blasting, whereas in this country the new technique of flame descaling is becoming increasingly popular.

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would be as follows—if the structure is such that there is no doubt that maintenance, that is, repainting will be perfectly efficient, then from the point of view of corrosion resistance, there would be no advantage in using low-alloy steel. If, however, there is a danger that maintenance will be inefficient or incomplete, say, from reasons of inaccessibility or if the desire is to get the maximum possible life from the protective coating and thus reduce maintenance costs, then the use of low-alloy steels should prove economical. There seems to be no doubt that paint behaves better on low-alloy steels than on ordinary steels. Experiment has shown that the average life of paint on ordinary steel was 2.8 years, while on copper-chromium steel it has exceeded 4 years.

Metallic Coatings

Before commencing a discussion of metallic coatings, the writer wishes to state frankly that he does not know very much about them. That is if, as it is proposed to do, statements are confined strictly to facts that have been personally observed. If the work of the Protective Coatings Sub-Committee can be continued without interruption and subject to the ordinary human laws of mortality, it should be possible in three or four years time to deal with the subject more fully than at present. It is a curious fact that no one yet has conducted a complete sur-

vey of protective metallic coatings for iron and steel, although the American Society for Testing Materials has in hand a very large series of field tests on coatings suitable for wires and fencing products. To remedy the deficiency, the British Sub-Committee has arranged for systematic tests on coatings applied to 15x10x $\frac{3}{8}$ in. steel flats which will be exposed in a similar manner to the standard specimens of the Corrosion Committee.

It is proposed to conduct tests on coatings of seven different metals and alloys—zinc, aluminum, lead, tin, cadmium, lead-tin alloy and zinc-cadmium alloy, which will be applied by as many different processes as possible and in different thicknesses. The specimens will be exposed to atmospheric and marine corrosion, in the former case at six different stations. In this way will be obtained for the first time a direct comparison of the respective merits of the different metals and of the various processes of application. At the commencement of the war the preparation of these specimens was almost complete and it was expected to have them all exposed by the end of this year. The work has been delayed a little, but it is now being pushed ahead, and the hope is to commence exposure comparatively shortly.

On the average, zinc is 15 times less corrodible than iron in the open atmosphere, although in heavily cor-

rosive industrial atmospheres the ratio falls one-seventh or one-eighth. In humid, enclosed and polluted atmospheres, however, zinc is as corrodible as iron itself and protective coatings of zinc are therefore useless. This is probably because the zinc corrosion products are deliquescent and keep the specimen moist. Two-oz. galvanized coatings will give reasonable protection to steel for times of the order of five years, even in the most heavily polluted atmospheres. In general, it is a mistake to economize on the coating thickness, although of course this can be adjusted to suit the type of exposure and clearly need not be so great in the case of a sheet on a farmer's barn in the heart of the country as in that of a Sheffield steelworks. In a rural atmosphere, the life of a 16 S.W.G. steel wire would be increased from 6 to 15 years when coated with 0.001 in. (0.6 oz. per sq. ft.) of zinc and in the case of 12 S.W.G. wire exposed in an industrial atmosphere, a zinc coating of 0.003 in. (1.80 oz. per sq. ft.) would increase the life from 5 to 14 years.

Finally, it remains to add that the use of sprayed zinc coatings for protection against marine corrosion is increasing. It is probable that the use of sprayed coatings of zinc and possibly of other metals for marine work will be greatly extended in the near future.



SURFACE

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THIS Brush surface analyzer provides topographic charts of the surfaces of finished parts. Readings less than 1 microinch, absolute, can be made. Analyzer head and drive mechanism are shown at the left, connected to direct-inking oscillograph and chart by flexible drive shaft. In the center is the calibrating amplifier. With a rigid standard mounted on a surface plate, the analyzer head can be adjusted vertically and horizontally, or moved around for positioning above test specimen.

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AS it must have been sooner or later, the question "How much is a microinch?" has been asked again by the experts on mechanical surface finishing. It has been asked again because the microinch which has been used in most recent discussions is only a mathematical concept—though frequently that fact appears to have been overlooked. It has been asked again, too, because—one authority avers—the means which have been used to determine microinch values of roughness on metal surfaces had led many to the conclusion that mere reduction in degree of roughness was the road to perfect load bearing, wear resisting surfaces.

Now the announcement of a new type of surface measuring instrument and its installation in the Chrysler Superfinish Laboratory at Detroit promises to alter considerably some already established ideas.

Heretofore, the measuring method most widely used gives meter readings representing continuous running averages of the heights and depths of surface irregularities in millionths of an inch or microinches. Mathematically, the microinch referred to in this case is the root mean square of the plus and minus values of the curve representing the surface profile. Obviously, this r.m.s. type of reading is not a determination of the maximum irregularity on the surface. Its nearest scientific parallel is the r.m.s. value of voltage given by an a.c. voltmeter.

Departing from the concept that measurements of surface finish should present averages of the sizes of defects, the Brush Development Co.,

3311 Perkins Avenue, Cleveland, has designed a direct recording instrument for rapidly analyzing the topography of finished surfaces. The instrument is noteworthy first of all because it is an *analyzer*, not a *generalizer*. Previously, analysis was by means of the cathode ray oscillograph type of instrument, with recording by means of a motor-driven camera—a laboratory set-up. On the other hand, only the generalizer type has been successful until now as a shop instrument or for anything resembling production inspection because it gives an instantaneous reading.

Second noteworthy fact is that the Brush surface analyzer gives microinch readings which are *absolute* values rather than r.m.s. values or averages. Magnification up to 100,000 times permits the making of satisfactory records of surface irregularities smaller than one-millionth of an inch. Plotting every detail of surface topography, the instrument furnishes an instantaneous and permanent record of irregularities, showing not only the amplitude, but also the form of these irregularities. The nature of the curve which is thus plotted automatically is such that it indicates how closely the surface approaches perfection. This, according to D. A. Wallace, Chrysler Superfinish developer, will direct the attention of experimenters to the job of getting a truly smooth surface rather than one which only has a decreased "roughness factor."

The Brush instrument consists of a

surface analyzer head mounted on an adjustable stand, a calibrating amplifier and a direct-inking oscillograph, as indicated in the photograph. Separately the various elements have been used in the past in scientific apparatus so that their reliability and accuracy are assured. Piezo-electric or so-called Bimorph crystals, used both in the analyzing head and to actuate the pen which records the profile on a moving chart, have been used in phonograph electric pickups and also in the physician's cardiograph. The calibrating amplifier is also taken directly from the latter instrument.

The analyzing head is a pickup mechanism mounted in an arm projecting from a gear drive mechanism. Mounted behind a hardened steel positioning shoe, or guide, the stylus used to explore the specimen surface is sapphire tipped, with a radius of 0.0005 in. The shoe rides over a relatively wide area of the surface and provides a reference level. The motion of this stylus over the test surface irregularities is transmitted through a mechanical linkage to the piezo-electric crystal as a varying pressure which generates a voltage between the electrodes of the crystal element. This voltage is directly proportional to the stylus deflection and is of the order of 0.0015 volts per microinch of deflection. The amplifier magnifies this voltage by as much as 60,000 times.

The crystal element construction, mounting and connecting electrical

PROFILES IN MICROINCHES

circuits are such that sensitivity is virtually independent of temperature variations ordinarily encountered. The protective tubing for the stylus is mounted at the extreme end of the pickup arm, which is pivoted in spring conical bearings attached to the gear drive mechanism. The output of the crystal element is connected to the calibrating amplifier by means of a single conductor shielded cable.

The drive head contains gearing and cams to impart to the stylus of the pickup either a rotary motion describing a circle of 0.050 in. diameter, or a reciprocating motion describing a straight line 0.050 in. long. One complete cycle of either motion takes 15 sec. Either motion may be selected by a knob on top of the drive case. Power required for operating the gear drive is obtained by a flexible shaft connected to the chart motor of the direct-inking oscillograph.

The calibrating amplifier is a specially designed two-stage type supplied with necessary power equipment which operates from a 110-volt, 60-cycle a.c. supply. The amplifier supplies all the necessary gain (magnifi-

cation) between the analyzing head and the direct-inking oscillograph. A calibrated step-type attenuator is included in the input of the amplifier to provide various degrees of magnification in pen movement up to 100,000 times, including mechanical amplification.

A calibrating circuit is also included which supplies a "test" voltage for adjusting the gain of the amplifier to provide any desired deflection on the oscillograph chart, accurately correlated to the sensitivity of the pickup arm. Each pickup arm is pre-calibrated and the sensitivity constant is supplied with the unit. In the most sensitive setting of the amplifier, the deflection on the chart of the oscillograph may be as high as 3 mm. (approximately $\frac{1}{8}$ in.) per millionth of an inch stylus deflection.

The output of the amplifier is connected to the direct-inking oscillograph by a two-conductor shielded cable. The oscillograph makes the graphic record of the irregularities of the surface under test, as picked up by the analyzing head and magnified by the calibrating amplifier. The oscil-

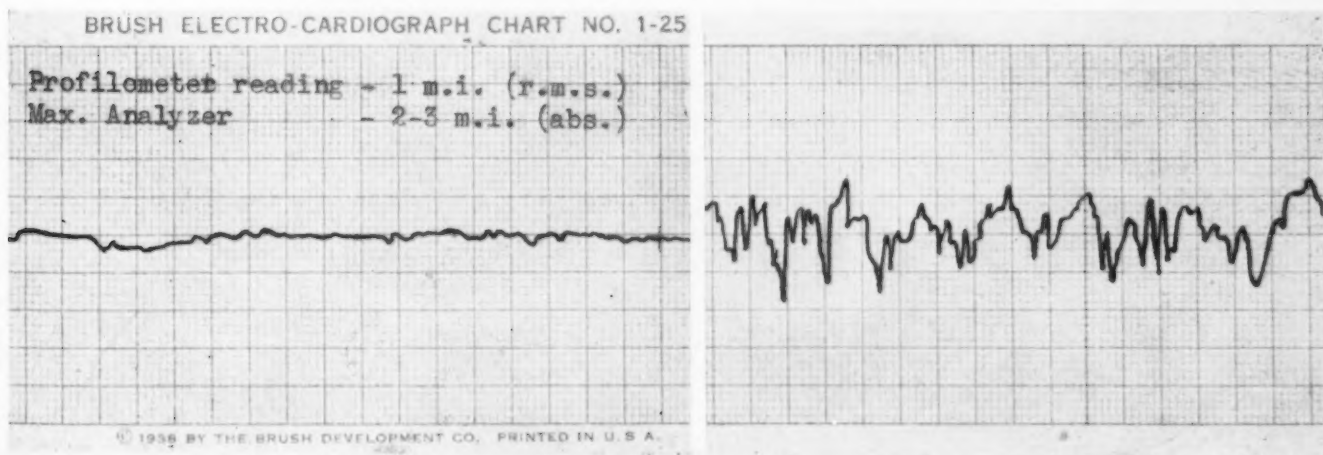
lograph is equipped with a direct-inking pen actuated by a crystal element which is thermostatically controlled for stabilization, and the fluctuations of the pen are recorded on a moving paper chart. The crystal-driven pen is designed for stiffness and low mass which enables it to respond to rapid fluctuations up to 60 or more vibrations per sec. This is accomplished while delivering sufficient power to the pen to overcome frictional errors. A maximum deflection of 20 mm. (approximately $\frac{3}{4}$ in.) each side of the zero axis is obtainable.

The chart feed mechanism is driven by a synchronous motor which also drives the pickup travel mechanism. This insures a constant speed through a gear train, providing a selection of any one of three rates of feed as follows:

- 1/5 in. per sec., equivalent to approximately 20 times linear magnification.
- 1 in. per sec., equivalent to approximately 100 times linear magnification.
- 5 in. per sec., equivalent to approximately 500 times linear magnification.

For most purposes, it appears that a feed of 1 in. per sec. provides the most easily interpreted chart.

SAMPLE charts illustrative of the topography of finely finished surfaces. Left, Section of a chart of a Superfinished round shaft. Vertical magnification 40,000:1, or 1 mm. to 1 micron. Horizontal scale magnification, 100:1. Chart speed 1 in. per sec. The maximum surface irregularity is seen to be 2 to 3 micron. The corresponding profilometer reading is 1 micron, r.m.s. Right, Brush surface analyzer chart of a finish ground surface. Vertical scale, 1 mm. equals 2 micron.



CASTING STEEL FOR FORD TRACTORS

THE development of a new Ford tractor and several accompanying implements, containing an unusually high proportion of steel castings, has focused attention on foundry technique. The total weight of the tractor is 2100 lb., of which more than 50 per cent is castings. Included are 553 lb. of gray iron, 173 lb. of malleable iron, 48 lb. of miscellaneous non-ferrous castings, and 381 lb. of steel castings.

The task of designing the tractor was started with the idea in mind of making the best possible use of new analyses of metal, and of new processes developed in recent years for the production of steel castings. From the beginning the metallurgist and foundrymen cooperated with the design engineers.

In order to go into volume production of cast steel tractor parts, and put some new ideas into practice, the steel foundry was revised and enlarged. The result was that steel castings could be poured continuously instead of intermittently as in ordinary practice. This was achieved by utilizing electric holding furnaces and conveyor reels which bring the molds directly to pouring spouts. The system not only saves time but produces more uniform castings, because the metal for each casting is delivered at uniform temperature and is of uniform composition.

Fully automatic casting is not feasible except in the case of some parts of uniform weight such as crankshafts. Semi-automatic casting is the practice for miscellaneous parts—front axles, radius rods, steering sectors and wheel flanges are some of the parts poured this way. The conveyor reel carries

By **R. H. McCARROLL and
E. C. JETER**

Ford Motor Co.

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the molds to the holding furnace where they are poured semi-automatically. (See Fig. 1.)

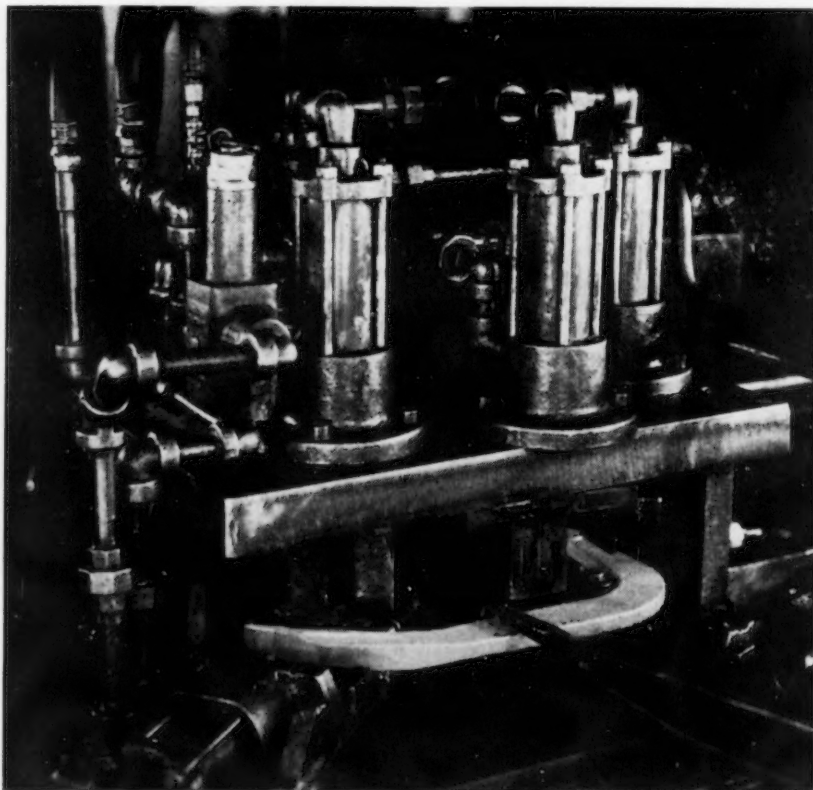
Sand slingers are used for ramming the molds for the heavier castings, and

squeeze-and-jolt machines for the smaller ones.

Each steel casting unit is laid out as a synchronized system, and following is a brief description of the principal components.

The metal is fed from a melting furnace into the holding furnace where it is kept at about 2950 deg. F. The capacity of this unit is 80 tons in 16 hr.

In addition to the main melting and holding furnaces, there is a two-ton



cold melt furnace to permit running different analyses when the need arises. This, of course, lends flexibility to the system.

For the production of small tractor and car parts, there is a similar but smaller system. This unit consists of a reel which carries sand molds made by vibrator molding machines to a holding furnace where the molds are poured semi-automatically as in the case of the larger installation. A melting furnace supplies metal at the rate of 40 tons in 16 hr. The metal is transferred directly through a trough to the holding furnace.

The castings are shaken out, gates and risers are removed. The heat-treating furnaces are near the shake-out so that heat loss is minimized. Here castings are either quenched (see Fig. 2) and drawn, or annealed according to the requirements of the individual part. Emerging from the heat treat, they are cleaned and inspected. Some are also tested here.

This equipment is sufficient for the production of sand castings necessary for 250 tractors per day. Production probably will be stepped up to about 400 before the end of spring, and this can be accomplished by additions of equipment to the present system.

Sharing interest with these units is

THE latest Ford foundry technique is described herein. Particularly interesting are the continuous cupola, automatic casting equipment, and various analyses of steel used for highly stressed parts, usually in the heat treated condition. Also interesting is the cast plowshare requiring a very hard point and toughness elsewhere. Data herein first were presented before a joint A.F.A. and A.S.M. Detroit meeting, Jan. 8.

the equipment for making gear blanks centrifugally. This system has been described in some detail (see THE IRON AGE, July 21, 1938) after its successful development for the production of passenger car gear blanks. It has now been adapted to the production of three tractor transmission gears and tractor differential gears.

Besides a 15-ton electric furnace feeding into a 10-ton holding furnace,

there also is a 2-ton cold melt furnace for special steels needed in smaller quantities, and a second one of the same size will soon be installed. Conveyor lines, annealing furnaces and other equipment complete the centrifugal unit.

The top section of each centrifugal die is removable. A conveyor circulates spare dies supplying the rotary casting tables. This conveyor serves both for storage and for cooling.

Gear blanks removed from the dies (see Fig. 3) are placed on a floor level conveyor for transferring to the annealing furnaces. A feature of this conveyor is that it operates at slow speed, and a sample from each group of castings is analyzed while the remainder are in transit.

Another recent development to be mentioned is the automatic crankshaft casting equipment. Both passenger car and tractor crankshafts will be poured with this equipment, which consists principally of two continuous forehearth cupolas, an electric furnace, a holding furnace and a pouring car such as is utilized on the cylinder block job in the gray iron portion of the foundry.

Formerly the steel was melted in electric furnaces and poured into the

AT RIGHT

FIG. 1—Pouring of miscellaneous steel castings for the Ford tractor. The conveyor reels bring the molds directly to the pouring spout.

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AT LEFT

FIG. 2—Various fixtures of this type hold the castings to proper form while they are being quenched.

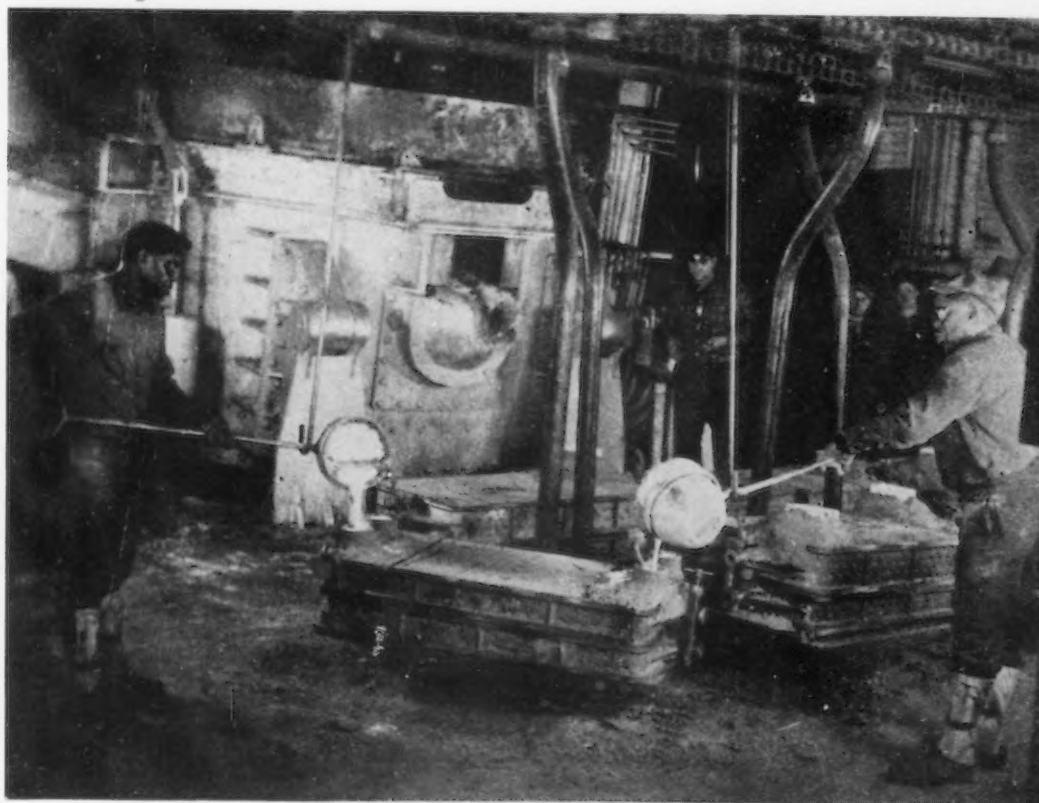




FIG. 3—The upper half of the centrifugal mold, or die, is removed and the gear blanks taken out in this manner. The floor-level conveyor is in the background.

crankshaft molds from ladles. With the new system, the steel will be melted in the forehearth cupolas, which will continuously supply molten steel of uniform composition. These melting units may be described as stack charged air furnaces. They are fired with pulverized coal at the discharge end of the hearth. The combustion gases go up the stack and preheat the incoming charge. About 300 lb. of coal per ton of metal are required.

The metal is poured from the cupolas at relatively low temperatures (about 2750 deg. F.) to save refractories, and then brought up to pouring temperature in a 15-ton electric furnace. From there it is transferred to a holding furnace which also is fired by pulverized coal. The metal then flows into a pouring car and is poured automatically into crankshaft molds. (See Fig. 4.)

A method of automatic pouring to be used on small steel castings can be illustrated by showing how it is used for gray iron in the Ford foundry.

A completely automatic method is already in use for producing the passenger car transmission housing. Under this system molten iron runs

from one of two 96-in. cupolas into a 15-ton holding furnace. It flows from the furnace into one of 12 refractory-lined bowls located around the outside of a revolving table. Each bowl is automatically filled, and revolves around an axis geared to the reel until it meets the mold coming into position on the conveyor line. A cam causes the bowl to tilt at a given spot and so pours the metal into the mold. The bowl continues around to take another charge while the conveyor brings new molds into position. (See Fig. 5.) Approximately 125 tons of iron can be poured in an 8-hr. shift.

To meet the physical property requirements of so many different castings, several types of steels are, of course, necessary. For this same reason a variety of heat treatments are also necessary. The accompanying table shows the cast steel analyses used for the various parts.

One steel (Type No. 1 in the table) is used for parts that are to be welded or ones that are to be surface hardened. The carbon and manganese are low so that areas adjacent to welds are not hardened, or so that surface hardened parts retain a soft core. Sev-

eral of the surface hardened parts are used on the tractor, for example hydraulic lift rods and ram arms.

Analysis No. 2 is a slight modification of an SAE 4620 steel. It is used for the same purpose that rolled SAE 4620 is used—namely, for parts that require a good wearing surface and a tough core. An example is the tractor differential gear.

Analysis No. 3 is a modification of the SAE 5100 steels. Passenger car transmission gears are made of this analysis.

No. 3-B analysis is used for tractor transmission gears. This part is given a light carbon case. The carbon is run higher than the No. 3 because the



larger section and greater load makes a harder core advisable.

Cast steel No. 4 accounts for the bulk of the tractor castings. Most of these parts are quenched and drawn to give the greatest possible toughness. This steel may be used in a number of different hardness ranges. Typical examples are the radius rods, front axles and steering sectors. These particular parts are quenched in water from 1470 deg. F. and drawn at about 1000 deg. F. This gives a Brinell hardness of about 302.

Not only is analysis No. 4 used extensively on the tractor, but it is used widely for implements, as for example the plow beam, which is used at a hardness of about 340.

Analysis No. 7 is used where a high

tensile strength is required, but where the requirements for ductility are not so great. The castings are annealed to 170-228 Brinell. This is accomplished by a simple anneal—1650 deg. F. for 30 min. at heat, and then cooling slowly to about 1100 deg. F.

Cast steel No. 8 is used chiefly for crankshafts. This has been previously discussed extensively. (See *THE IRON AGE*, Aug. 15, 1935.) Cast steel No. 9 is used chiefly for pistons. This job is also not new and over 24,000,000 pistons have been produced in the past four years.

Upon studying the physical properties in the table, it can be seen that steel castings, besides having advan-

tages already mentioned, can be counted on for properties comparable to those of forged steel. Depending on the particular part requirement, some of these types are used with only an annealing treatment, while others are heat treated to various hardnesses. It can be seen that the properties of the heat-treated bars under No. 3 and under No. 4 indicate clearly that these steels would be entirely satisfactory for highly stressed parts such as gears, front axles and plow beams.

One interesting recent development requiring special physical properties is the cast plowshare. This has to be very hard on the point but of a modified hardness on other portions of the

share. It has been possible to get very good results using No. 3 steel with a special heat treatment.

Steel castings have proved very satisfactory for implements as well as for the tractor itself. Evidence of this conviction is shown by the fact that the plow unit weighs 310 lb., with steel castings accounting for 200 lb. of this, including parts such as the beam and the share. Because of the greater flexibility in design permitted by the casting method, weight is saved and parts can be made at lower cost than is possible by conventional methods.

Methods of manufacture of these cast steels are divided into three principal classes—green sand castings, dry sand castings, and centrifugal permanent mold castings.

Green sand as a material for molds is the most widely used for castings of all types. Ford practice is to make as many castings as possible in one mold—and in some instances the sections of molds are stacked, thus making several layers of castings at one pouring.

Quality in sand castings depends, of course, on a number of conditions. Among them are factors such as correct analysis of metal, fluidity, correct degree of deoxidation, proper gating and venting of molds, correct condition of sand as to permeability, bond strength and percentage of moisture. By A. F. A. standard, permeabilities of about 120 for large castings and about 100 for small castings are used,

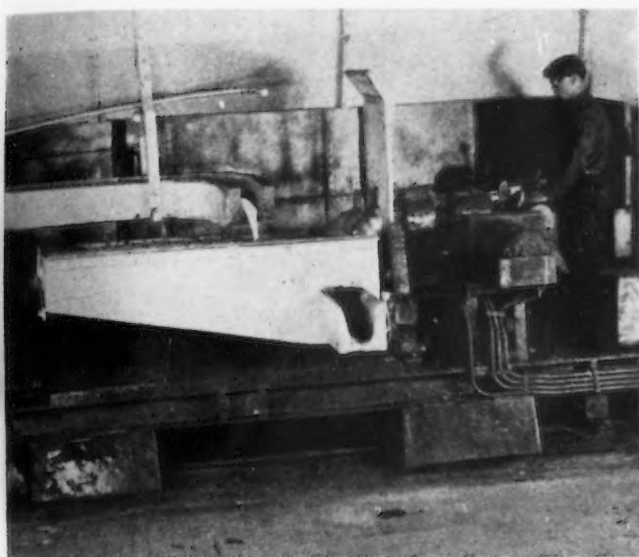
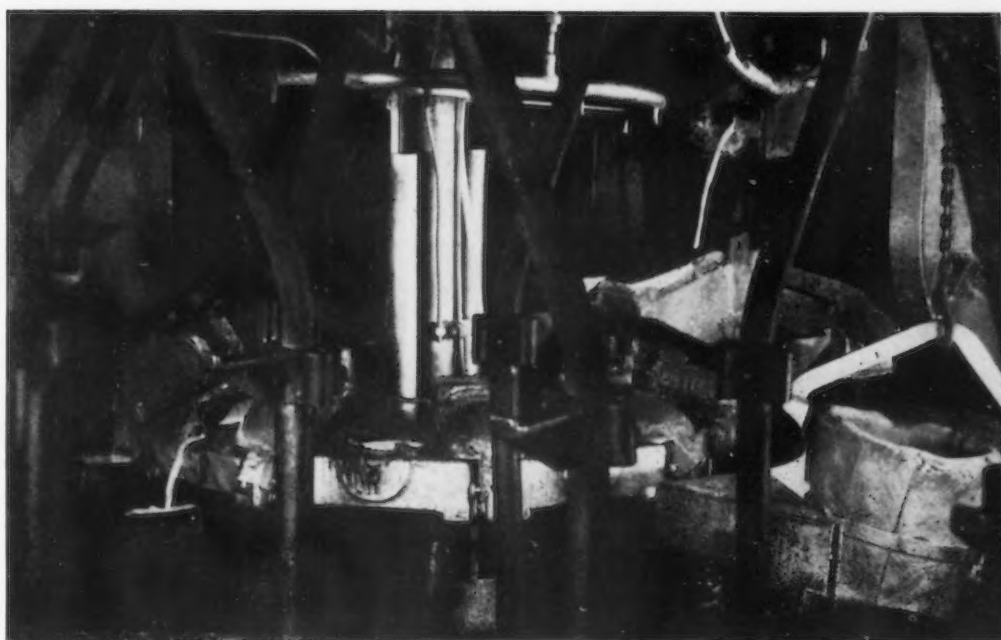


FIG. 4—This automatic pouring car is being filled from a holding furnace prior to automatically pouring crankshafts.

FIG. 5—Automatic pouring equipment for small parts—approximately 125 tons of iron can be poured in an 8-hr. shift. Twelve refractory-lined bowls around the edge of a revolving table are successively filled from a 15-ton holding furnace. Traveling around the conveyor until it meets a mold coming into position on the conveyor line, the bowl is tilted by a cam at a given spot and so pours the metal into the mold.



ANALYSIS AND PHYSICAL

Type	Parts	Carbon	Copper	Silicon	Manganese	Molybdenum	Chromium	Phosphorus	Sulphur	Miscellaneous
No. 1	Steering Wheel Hub, Radius Rod Yoke, etc.	0.25-0.35	1.50-2.00	0.60-0.80	0.40-0.60	.....	.....	0.05 Max.	0.08 Max.	.....
No. 2	Truck Ring Gears and Parts to be Carburized	0.18-0.25	0.50-1.50	0.20-0.40	0.40-0.60	0.25-0.35	0.10 Max.	0.05 Max.	0.05 Max.	Ni. 1.65-2.00
No. 3	Centrifugal Castings Trans. Countershaft and Differential Ring Gear	0.30-0.38	0.50-1.50	0.20-0.40	0.55-0.75	0.10-0.20	0.80-1.00	0.05 Max.	0.05 Max.	.....
No. 3B	Tractor and Truck Transmission Gears	0.38-0.45	0.50-1.50	0.20-0.40	0.55-0.75	0.10-0.20	0.80-1.00	0.05 Max.	0.05 Max.	.....
No. 4	Tractor Radius Rods, Tractor Front Axle Rear Axle Flange, Plow Beams, etc.	0.35-0.45	0.50-1.50	0.20-0.40	0.70-0.90	.....	.....	0.05 Max.	0.05 Max.	.....
No. 6	Balls and Races	0.90-1.10	.....	0.20-0.40	0.20-0.35	.....	1.10-1.30	0.05 Max.	0.05 Max.	.....
No. 7	Truck Rear Axle Housing—Furrow Wheel	1.35-1.55	.....	0.90-1.10	0.40-0.60	.....	0.08 Max.	0.10 Max.	0.08 Max.	.....
No. 8	Crankshafts	1.35-1.60	1.50-2.00	0.85-1.10	0.70-0.90	.....	0.40-0.50	0.10 Max.	0.08 Max.	.....
No. 9	Piston	1.40-1.60	2.00-2.50	0.90-1.10	0.80-1.00	.....	0.15-0.20	0.10 Max.	0.08 Max.	.....
.....	Valve Insert	1.20-1.40	1.50-2.00	0.30-0.60	0.30-0.50	.....	2.5-3.5	.....	.....	Tungsten 14.0-17.0
.....	Valve	0.95-1.20	.....	2.0-3.5	0.20-0.30	.....	15.0-16.0	.....	.....	Nickel 14.0-15.0
Regular Malleable	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ford Malleable	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Forged Steel	.....	0.30	.....	.....	.....	.....	.....	.....	.....	.....
Forged Steel	.....	0.40	.....	.....	.....	.....	.....	.....	.....	.....

the bond strength being 10-12 on both of these. The moisture in each case is about 3 per cent.

Dry sand molds are used for very heavy castings that require a great degree of accuracy. This type of mold is used chiefly for holding the shape and size of heavy castings. The cast crankshaft is the most typical example

of a heavy casting made in dry sand molds.

The requirements for successful centrifugal die casting probably are not as well known. Experiments with this method began several years ago. Partial production of passenger car and truck gears was begun two years ago, and the decided success of this work

led naturally to adaptation of the same method to the production of tractor gear blanks.

Gear blanks, requiring as they do particularly high quality metal in the portions where the teeth are cut, are well suited to the centrifugal method. The centrifugal force produces castings free of imperfections, and the

PROPERTIES OF CAST STEELS

Way Cast	Heat Treatment Deg. F.	Elastic Limit, Lb. Per Sq. In.	Tensile Strength, Lb. Per Sq. In.	Elongation in 2 Inches, Per Cent	Reduction in Area, Per Cent	Brinell Hardness	Modulus of Elasticity
Sand		53,800	71,100	18.5	33.0	163	
	Normalize-Carburize and direct quench or reheat and oil quench and draw to Rockwell "C" 58-62						
Centrifugal Sand	Normalized	47,000	85,000	21.0	35.0	160	
Centrifugal Sand	Normalized	44,000	87,000	18.0	28.	160	
Centrifugal Sand	1500 Oil Quench, 950 Draw	136,000	140,000	7.0	14.0	502	
Centrifugal Sand	1500 Oil Quench, 950 Draw	135,000	144,000	6.0	13.3	302	
Centrifugal Sand	1500 Oil Quench, 850 Draw	142,000	148,000	5.0	14.6	321	
Centrifugal Sand	1500 Oil Quench, 800 Draw	166,000	180,000	3.0	5.3	364	
Centrifugal Sand	1500 Oil Quench, 800 Draw	150,000	166,000	2.0	5.3	364	
Centrifugal Sand	1500 Oil Quench, 425 Draw	192,000	199,000	1.5	3.6	430	
Centrifugal Sand	1500 Oil Quench, 355 Draw	212,000	218,000	0.75	3.0	477	
Centrifugal Sand	1500 Oil Quench, 355 Draw	207,000	221,000	0.5	3.0	477	
	Normalize to Brinell of 170-196 Harden gears as per part print.						
Sand	Normalized	65,120	90,750	15.2	26.0	192	
Sand	1470 Water Quench, 1125 Draw	108,150	128,620	10.0	22.0	277	
Sand	1470 Water Quench, 1000 Draw	129,500	139,200	8.0	19.7	302	28,400,000
Sand	1470 Water Quench, 850 Draw	152,900	157,500	5.5	13.6	341	
Sand	1470 Water Quench, 750 Draw	171,700	173,600	5.0	10.7	364	
	Normalize-Grind-Quench and Draw to Rockwell "C" 62-65						
Sand	Normalized	84,000	103,000	9.0		207	24,400,000
Sand	Normalized	95,080	120,250	6.5		255	27,000,000
Sand	Normalized	85,000	104,710	7.5		229	
	1450 deg. F., at heat 30 min. Cool in 3 hr. to 1000 deg. F. Rockwell "C" 38-46						
	Annealed	38,000	52,000	15.7		119	
	Annealed	43,000	60,500	14.0		140	
	Normalized	60,000	85,000	27.0		165	
	Normalized	80,000	110,000	20.0		225	

metal cools so rapidly against the metal mold that the dendritic formation is retarded or entirely absent. The speed of spinning is not high, ranging from 250 to 400 r.p.m. depending on the outside diameter of the gear.

The centrifugal molds are designed simply, with enough bulk to dissipate the heat. To overcome the "cutting

action" of incoming metal, small cores are used. A core is nearly always required for some undercut in the gear. By considering this when designing the mold, it usually is possible to use the same core both to protect the mold and to produce the correct undercut in the gear.

In the Ford foundry, the mold life

is very good. Several satisfactory metal analyses are used—but there is no attempt to definitely set on any one to the exclusion of the others. The major requirement is for a low carbon material, under 0.25. Varying amounts of molybdenum and chromium may be used with this, both in combination and separately.

WHAT'S NEW IN MACHINE TOOLS

By FRANK J. OLIVER

Associate Editor, *The Iron Age*

A COMPLETELY redesigned universal toolroom grinder has been introduced recently, and a manufacturer of roll grinders has brought out a more general purpose cylindrical grinder of traversing table type. A tool grinder in which the wheel is traversed across the cutting edge is a novel departure from the conventional design. Two new applications of broaching equipment are illustrated, also a new carbide tool grinder, dust collector for grinders, abrasive cut-off machine, precision external honer, power reamer, a new form of Superfinisher, and tapping and threading equipment. Described in the text is an improved saddle type turret lathe and a novel form of universal woodworking machine.

A UNIVERSAL grinding machine that is new throughout has been announced by *Cincinnati Grinders, Inc.*, Cincinnati. The aim of the design has been to give the average toolroom operator closer tolerances and higher standards of finish in shorter time and with less physical effort. Controls are conveniently grouped and a single lever initiates coolant flow, work rotation and table traverse. Other features include two-speed hand table traverse and tow-speed wheel cross traverse.

The wheelhead incorporates the recently announced Filmatic spindle bearings, of submerged, multiple shoe construction, steel backed and bronze lined, and self-adjusting for variations in load. Grinding wheel and driving sheave are located exceptionally close to the bearings so as to reduce bending moments and shaft deflections to a minimum. Spindle is driven by multiple V-belts from a 3-hp. motor mounted directly on top of the wheelhead unit, which is held down to the bed by square gibbing.

An internal grinding attachment, hinged to the front of the wheelhead, is standard equipment. This arrangement reduces set-up time for internal grinding work as it is only necessary to swing the attachment down and tighten one bolt. Even the belt may be left on the pulleys when the unit is not in use.

V-belts are also used for primary and secondary drives of the headstock, which employs a new mechanical speed change device, eliminating the need for a variable speed d.c. motor. An infinite number of work speeds may be obtained, varying from 55 to 500 r.p.m., by merely rotating a handwheel at the front of the headstock unit. The headstock may be swiveled at right angles to the grinding wheel spindle for face grinding operations, and it may be quickly changed from live to dead spindle operation.

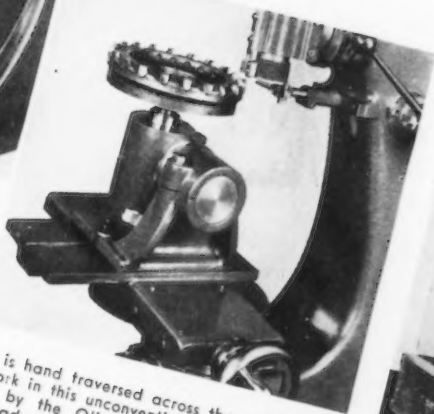
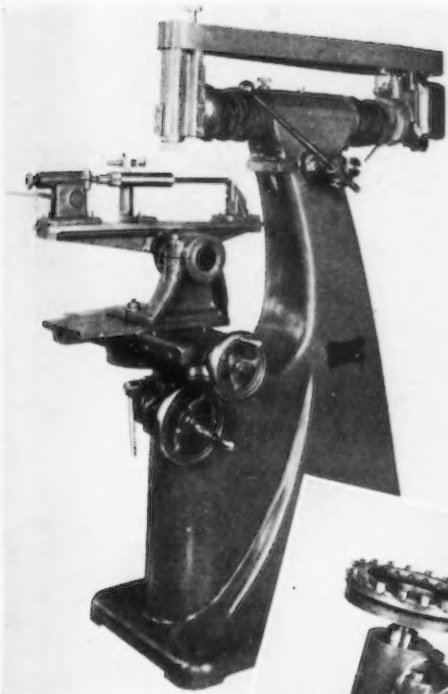
Table feed is actuated hydraulically from a circuit supplying pressure on both sides of the piston, providing infinitely variable feed rates from 3 to 240 in. per min. Tarry at either end

of the stroke may be independently controlled. Accuracy of table reversal at any speed is within 0.004 in. Table reciprocation may be set as short as 3/32 in., producing an effect comparable to a grinding wheel reciprocating attachment. With the automatic pick feed of the wheelhead engaged at the same time, the resulting cycle can be used as a substitute for automatic plunge-cut cycle.

Standard hand table traverse is mechanically operated, and two speeds are provided—one rapid feed for setting up and for long movements, and a fine feed for shoulder grinding. The hand infeed of the wheelhead also has two speeds. For accurate sizing, the device may be adjusted in increments of 0.0001 in. reduction of work diameter. Automatic infeed at table reversal may be adjusted from 0.0004 to 0.014 in. Table ways are pressure lubricated with filtered oil and are protected by telescopic guards. All power operated mechanisms are either pressure lubricated or submerged in oil.

Cylindrical Grinder

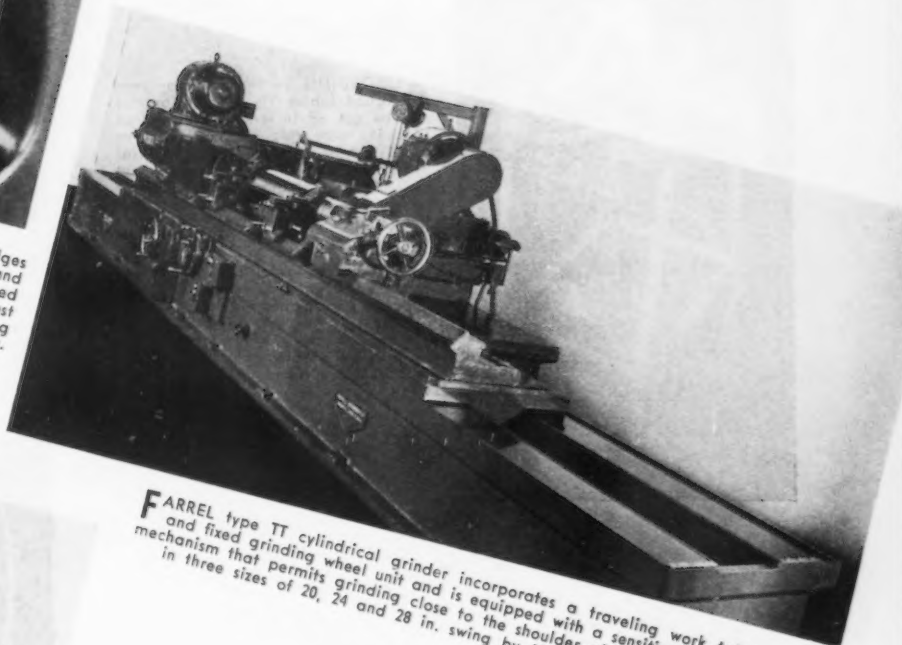
FOR the first time, *Farrel-Birmingham Co., Inc.*, Ansonia, Conn., is offering a general line of cylindrical grinders with traveling work table and fixed grinding wheel unit in sizes of 20, 24 and 28 in. diameter and 18 ft. between centers. Heretofore the company has built roll grinders of the traversing wheel unit type in 28 in. diameter swing and larger. Tables of the new type TT units are driven



THE grinding wheel is hand traversed across the cutting edges of the stationary work in this unconventional type of tool and cutter grinder made by the Oliver Instrument Co. Exposed sections of the wheelhead ram are protected from grinding dust by means of boots. Inset shows the adjustable Timken bearing head used for grinding face mills on the face and periphery.



OPERATING controls on the new Cincinnati hydraulic universal grinding machine are grouped close together for convenience, and unit construction is used, permitting any control unit to be removed independently of the others. Workhead has a mechanical type variable speed drive. This machine has a swing of 12 in. and can be obtained in between-center lengths of 24, 36, 48 and 72 in.



FARREL type TT cylindrical grinder incorporates a traveling work table and fixed grinding wheel unit and is equipped with a sensitive reversing mechanism that permits grinding close to the shoulder of the work. Made in three sizes of 20, 24 and 28 in. swing by 18 ft. between centers.

AT LEFT

TYPE AIR-1 Air Master is a new self-contained dust collector unit for attachment to exhaust outlets of grinders and buffers. The grit laden air is filtered through a series of closely woven fabric and steel wool filter bags and exhausted through an opening from the top of the cabinet. A foot lever is employed to shake dust loose from the bags into a removable tray. Fully inclosed motor, suction fan and filter bags are all contained within the case, which is an insulated cabinet mounted on rubber feet for quietness. Made in two sizes by the Cincinnati Electrical Tool Co., Cincinnati.



IMPROVED carbide tool grinder with $\frac{3}{4}$ in. arbor, announced by the Baldor Electric Co., St. Louis. Motor is a $\frac{1}{2}$ -hp. heavy-duty production type, dynamically balanced and equipped with ball bearings and thrust washers to eliminate all end play. It is an inclosed type and is reversible so that roughing or finishing of both right and left-hand tools may be done conveniently. Flanges accommodate either steel-backed silicon wheels or diamond wheels, 6 in. in diameter. Tool rest tables are 10 x $3\frac{1}{2}$ in.

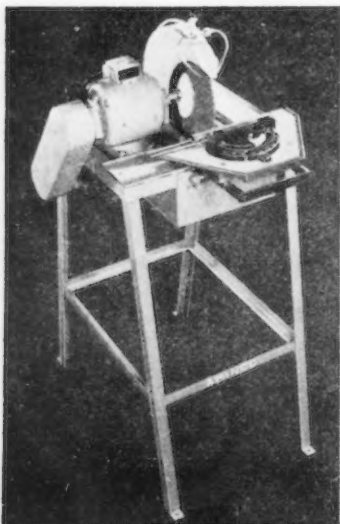
AT RIGHT

THIS shuttle type fixture and special tooling on a Colonial hydraulic broach press enables an automobile manufacturer to test the strength of steel hub core and spoke castings for steering wheels and straighten the spokes at the same time. On the down stroke, the spokes are bent downward by notched bars on the crosshead, and the automatic return stroke causes the spokes to be bent back into the correct position. The flexing reveals any flaws in the casting. The machine is completely automatic in operation and requires only laying of the casting in the shuttle fixture in its retracted position. Production: 300 pieces per hr. Machine is made by the Colonial Broach Co., Detroit.



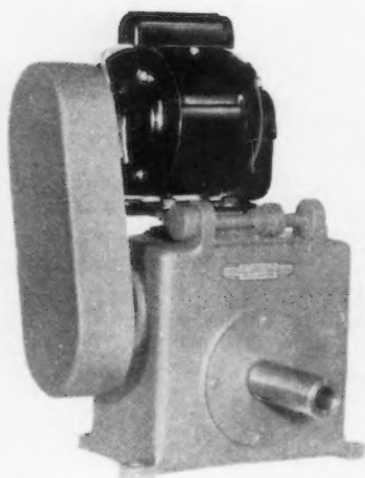
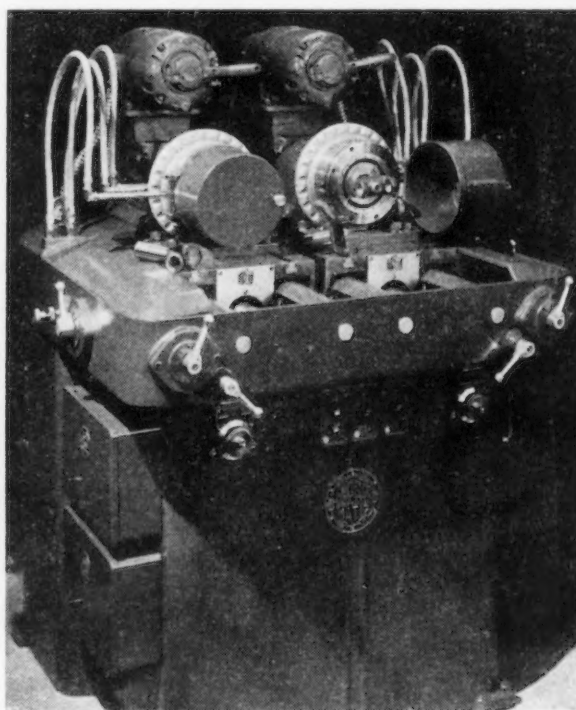
AT LEFT

ACCORDING to the manufacturer, glass tubing $1\frac{1}{2}$ in. in diameter can be cut off in lengths as short as $1\frac{1}{32}$ in. with this bonded abrasive wheel cut-off machine recently introduced by the American Instrument Co., 8010 Georgia Avenue, Silver Spring, Md. It can be used for cutting glass, ceramics and metals on flat surfaces up to $3\frac{1}{2}$ in. thick and on rods and tubing up to 6 in. thick by rotating the material as it is being cut. The 12-in. diameter rubber bonded abrasive wheel (0.04 to 0.06 in. thick) is mounted directly on the armature shaft of an a.c. motor. Table is adjustable for various angles. Coolant pump is built in.



BELOW

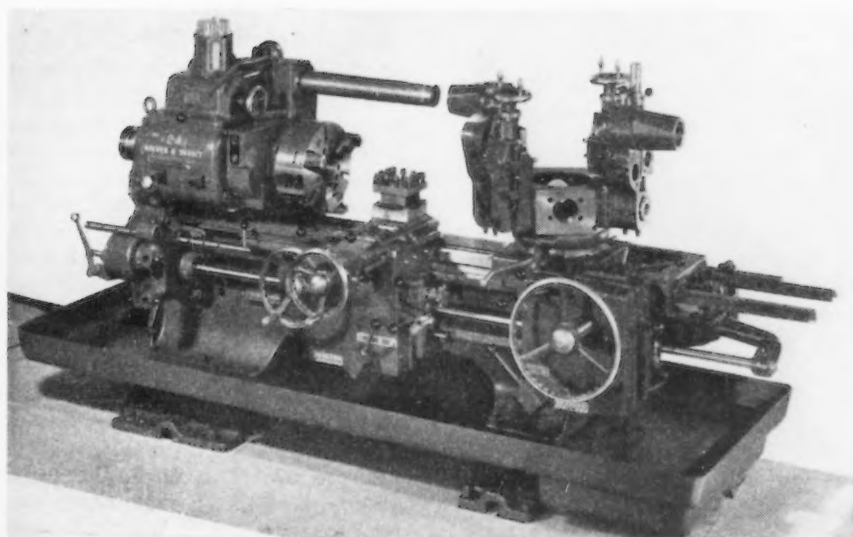
A MODIFICATION of the Micromatic Hydrohoner (THE IRON AGE, Sept. 14, 1939, p. 77) is this multiple spindle, external honing unit, especially designed for microfinishing the surface on universal joint rear yokes, 1.345 in. diameter by $2\frac{7}{8}$ in. long. Following grinding, approximately 0.0005 to 0.0008 in. of stock is removed in 15 sec., with a tolerance of 0.0002 in. for roundness and 0.0005 in. for taper. Surface finish is within 4 microin., r.m.s. The yoke is chucked in the machine spindle and is rotated and reciprocated within the fixed stone holder, which can be seen in the head of the machine. This stone head may also be reciprocated by hydraulic power if desired. Spindle reciprocation is by an adjustable swash plate, remotely controlled, which produces rapid, odd-ratio spindle reciprocation relative to the rotation. Made by Micromatic Hone Corp., Detroit.



BENCH type reaming machine offered by the Catskill Metal Works, Inc., Catskill, N. Y. Unit is motor driven through a three-step V-belt drive. Besides being useful for finish reaming and burring, this machine may also be used for tapping and broaching of keyways.

AT RIGHT

ONE of the latest types of Foster Superfinishing machines is this 12-spindle rotary machine for superfinishing Chrysler valve tappet bodies. The machine, shown with top cover off, is arranged with centerless drive of the work and is fully automatic in operation. At the beginning of the cycle, the work-driving rolls are stationary and the superfinishing head is raised out of the way. Shortly after the valve body is loaded, the table which rotates to the left, picks up the drive from a V-belt and starts the rotation of the driving rolls. Simultaneously, the superfinishing head lowers and oscillates over the surface with a short, fast stroke. A lower traversing stroke may also be included. Production is 750 tappet bodies per hr. Made by the Foster Machine Co., Elkhart, Ind.

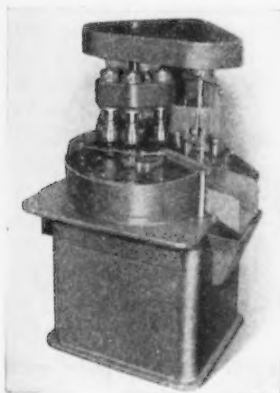


AT LEFT

THE Warner & Swasey preselector speed control is standard equipment on this new 2-A saddle type turret lathe. Heavier walled hexagon turret units give greater rigidity for modern heavy tooling equipment.

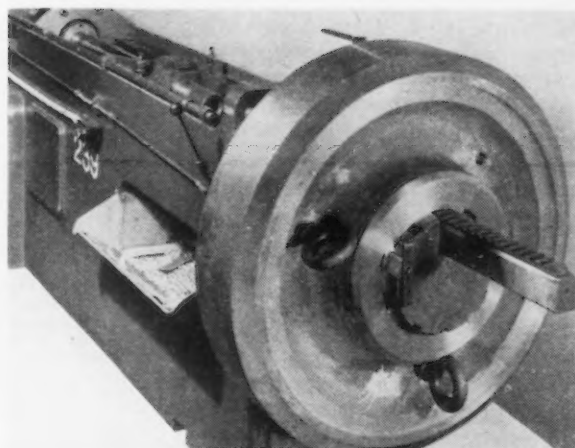
BELOW

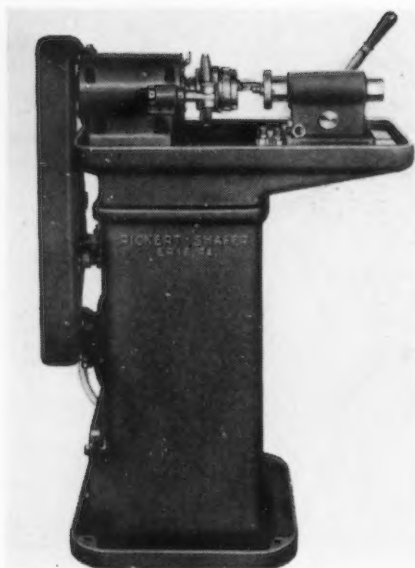
ILLUSTRATED is the new semi-automatic threading machine made by L. J. Kaufman Mfg. Co., Manitowoc, Wis. This machine performs a threading and reaming operation on 1600 to 2100 steel pieces per hour. Loading is by hand, with parts ejected automatically. Machine embodies a 30-station revolving dial having suitable work holding inserts or chucks. It is equipped with three 1 in. rotating self-opening die heads and three reamers, with individual vertical adjustment provided each tool. The various operating mechanisms are air controlled and interlocked for foolproof operation. The large base has ample capacity for coolant.



AT RIGHT

PRODUCING of accurate splines on large gear blank hubs in limited quantities is being done on this horizontal Colonial broaching machine equipped with an accurate index plate mounted on the faceplate of the machine. In the example shown, the splines are 1 in. deep, 1 1/4 in. wide and about 15 in. long, the blank having an inside diameter of 11 1/2 in. Two broaches are used to take care of the large depth of cut and each of the 10 splines is completed in turn before indexing to the next position. The blank illustrated is for a Cone area-contact worm wheel, produced by Michigan Tool Co., Detroit.





HORIZONTAL hand threading and tapping machine of compact design recently announced by the Rickert-Shafer Co., Erie, Pa., and intended for second operation threading and tapping up to $\frac{3}{4}$ in. A standard R & S model C self-opening die head mounted on the ball bearing spindle is automatically closed on the backward movement of the operating lever. Tapping operations are accomplished with a model C collapsible tap. Suitable work holders for a wide variety of production threading are available for work of irregular shape, as well as collet-type holders for round stock. Machine is motor driven with a three speed V-belt and has oil pump and reservoir.

by rack and worm through suitable gearing from an adjustable speed reversing motor. Reversing of the table is accomplished electrically, without the use of mechanical clutches. The table may be moved manually, however, by means of a handwheel and clutch. There is also handwheel control for hand feed of the grinding wheel as well as electrical controls for rapid in and out movement of the wheelhead. Start and stop push buttons control the motors driving grinding wheel, table traverse and water pump, and a start-jog-stop station controls the headstock. There is also an emergency master stop station, with reset button and red indicating light. All these controls are within easy reach of the operator's station.

Stability is imparted and maximum production and accuracy assured by heavy construction. The back bed, on which the grinding wheel unit is mounted, is keyed and bolted to the front bed, and both beds are extremely heavy, with deep sections well ribbed. Table itself is of Meehanite high strength iron and is of rugged construction. It carries the headstock, footstock and neck rests for supporting the object to be ground. Seven motors are required for drive; eight

if a taper grinding mechanism is incorporated. Grinding wheel and headstock are driven through V-belts and the gear unit for the table drive is also driven in the same manner to produce freedom from vibration throughout the machine.

Tool and Cutter Grinder

CONTRARY to conventional tool and cutter grinder design, a machine has been introduced by the Oliver Instrument Co., Adrian, Mich., in which the work is held stationary and the grinding wheel traverses the



RIPPING, bevel ripping, dadoing, rabbeting, routing, tenoning, jointing, sanding and shaping, besides a variety of cross-cut work at any angle, are possible on this ingenious universal woodworking machine, known as the Uni-Point radial saw. The Senior model is shown with saw tilted for compound miter work.

cutting edge of the work, which may comprise all types of milling cutters and reamers. The grinding wheel is carried on the forward end of a ram which slides in a fixed bearing at the top of the pedestal. On the rear of

the ram is the driving motor, belted to the grinder spindle. This ram has a stroke of 10 in. and is traversed by rack and gear, actuated by an adjustable hand lever. The advantage of this method of grinding cutters is said to be that the operator stands in a natural position, with work directly in his line of sight so that it is easier to guide the wheel against the lip rest.

This Oliver cutter grinder can be supplied with or without fixtures and is adapted for single operation grinding in large toolrooms. A Timken mounted head with taper spindle is available for grinding face mills up to 14 in. in diameter on face and periphery at one setting, and many odd types, such as dovetail cutters, can be ground with the same fixture. Special fixtures have been developed for grinding round corners on end mills, for small end mills, for broach grinding, tap sharpening and point thinning.

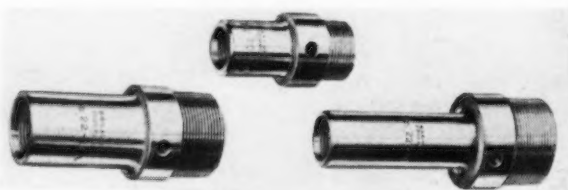
Turret Lathe

A NEW 2-A saddle-type turret lathe with an effective swing of 20 in. and a bar capacity through the spindle of $3\frac{1}{2}$ in. is announced by the Warner & Swasey Co., Cleveland. Major improvements include a heavier walled hexagon turret, completely redesigned aprons, a new type single lever control for feed selection, a new head brake, and an improved system for lubricating the head stock. The machine has the new rigid bed design which is now standard on all of the company's saddle-type machines. Multiple disk clutches on the rapid traverse make it easier to apply power to the turret unit and give the operator better control over its operation. The rapid traverse nuts are mounted on anti-friction bearings to remove radial loads from the feed shaft proper.

This machine has 12 spindle speeds running in a geometric progression from 17 to 460 r.p.m. With a two-speed motor, double this speed range is available. The universal cross slide has 16 reversible power feeds, which increase uniformly to provide a proper

(CONTINUED ON PAGE 66)

FEEDING finger adapters recently announced by Brown & Sharpe Mfg. Co., provide definite advantages and economies when used in B. & S. screw machines. They permit the same feeding finger to be used in machines of several sizes, instead of a different one for each machine, and they also permit the use of small feeding fingers for small work on large machines, resulting in improved operating conditions and reduced tool cost. One end of the adapter threads into the end of the feed tube and the opposite end is threaded to accommodate the threads of the feeding finger.



Governmental Control of Industry Decried at California Conference

DEL MONTE, CAL. — Resolutions opposing extension of the Walsh-Healey Public Contracts Act as provided by pending Senate Bill 1022 and urging the defeat of the LaFollette-Thomas Labor Bill were passed by the 16th annual conference of California Iron, Steel, and Allied Industries meeting here last week.

Difficulties of doing business under the constant threat of radical state legislation and in a national economy strangled by bureaucracy overshadowed technical steel topics in the discussions of the conference.

James F. Lincoln, president of the Lincoln Electric Co., Cleveland; James Musatti, general manager of the California State Chamber of Commerce; and W. C. Mullendore, executive vice-president of Southern California Edison Co., Ltd., all decried increasing governmental control of industry, and declared that no real industrial recovery could come until the basic philosophy of free enterprise and the profit incentive are restored.

Musatti, who was active in combatting the "Thirty Dollars Every Thursday" or "Ham and Eggs" measure in last fall's election, declared that "the first consideration of every business man must now be politics, because business is so closely tied to it."

"Relief, taxation, and migrants are the three basic problems facing California today," he declared. Payment of the highest relief and old age pensions in the United States, together with mechanization of agriculture in the Midwest and South, have been responsible for the entrance into the state of 400,000 migrants since 1933, he said.

This influx has contributed to increasing the State's relief rolls to 800,000 persons, or nearly 12 per cent of the population, and bringing the annual cost of public assistance of all kinds in California to \$250,000,000—more than is spent for public education, according to the speaker. He cited one California county in which the tax bill had risen 147 per cent in the last decade.

Mullendore, speaking on "Some Obstacles to Recovery," warned of the necessity of "distinguishing real recovery from that which we now commonly call recovery."

"These brief periods which many of us have referred to as recovery in the past few years in fact were mere fits of increased business activity, artificially induced, and interspersed

between sinking spells in this 'chills and fever economy' of the New Deal."

Reviewing the past decade he referred to the "undermining of the morals and morale of great sections of the population, not only by flagrant buying of votes in the name of relief, social security and humanitarian reform, but the example set by government with respect to integrity and simple honesty . . . dishonest and 'phony' bookkeeping indulged in by government agents and agencies both with respect to the budget and the income and outgo of government in operating business ventures; unfair, misleading and destructive competition by government with its citizens; collusion by government agencies with minority factions of its citizens. . . In other words, government and government officials, while protesting their devotion to the improvement and protection of high moral standards . . . in fact set many bad examples in practice."

In one of the two speeches not touching on the relationship of government to industry, H. S. Washburn, president of the American Foundrymen's Association, advocated cooperation of customers and jobbing foundrymen to quote prices on the basis of average costs.

He urged a method of pricing by which the foundry would be allowed a definite percentage profit as the solution to a highly competitive condition among jobbing foundries. In this connection, he strongly urged a sound cost system.

Discussing "Cooperation with the United States Army for National Defense," Lt. Col. Welton J. Crook of the Ordnance Reserve, former chief metallurgist for Pacific Coast Steel Corp., outlined the system of educational orders by which industry is now being educated in the problems of ordnance production for the duties it will be called upon to perform in time of war.

"Educational orders will be distributed among as many qualifying concerns as possible," Colonel Crook stated. "It is probable that during the five-year period (from 1939) several hundred manufacturers will be given an opportunity to acquire actual experience in the production of critical items. The policy adopted will be that of 'minimum actual production with maximum of education.'"

Resolutions passed by the conference, in addition to those dealing with

the LaFollette-Thomas Labor Bill and the Walsh-Healey amendments, included the following:

1. Favoring in principle mediation of labor disputes on a voluntary basis.

2. Opposing in principle the enactment of state legislation patterned after Federal acts such as the Wagner National Labor Relations Act, National Fair Labor Standards Act, Norris-LaGuardia Anti-Injunction Act, and the Walsh-Healey Public Contracts Act.

3. Favoring the consolidation of all types of public assistance into one integrated program, local administration, and joint state and county financing of California relief. (These questions are now pending before the State Legislature.)

4. Opposing production-for-use and further liberalization of old age aid in California.

In conjunction with the general conference was the Pacific Coast regional foundry meeting. Speakers before this group were C. E. Hoyt, executive vice-president of the American Foundrymen's Association, who discussed the association's activities; J. P. Gill, chief metallurgist of Vanadium Alloy Steel Co., and president of the American Society for Metals, whose topic was "Machining of Metals;" and D. J. Reese of International Nickel Co., Inc., who spoke on "Cupola Practice."

Conference Reelects Officers

Conference officers were reelected. They are B. J. Osborne, Moore Dry Dock Co., Oakland, chairman; C. B. Tibbetts, Los Angeles Steel Casting Co., vice-chairman; and C. S. Knight, California State Chamber of Commerce, secretary.

Officers elected by the Pacific Coast Steel Fabricators Association, which held its annual meeting during the conference, are P. F. Gillespie, Judson-Pacific Co., San Francisco, president; B. J. Osborne, Moore Dry Dock Co., Oakland, vice-president; and T. A. L. Loretz, Los Angeles, general manager. Directors elected, besides Messrs. Gillespie and Osborne, are T. L. Hanning, Steel Tank & Pipe Co. of Oregon, Portland; D. G. Henderson, Consolidated Steel Corp., Los Angeles; Charles McGonigle, Poole & McGonigle, Portland; Paul Pigott, Pacific Car & Foundry Co., Seattle; George Raitt, Steel Tank & Pipe Co. of California, Berkeley; A. B. Shafer, Garrett & Shafer Engineering Works, Seattle; R. A. Stumm, Southern Pipe & Casing Co., Azusa, Cal.; Charles W. Broyles, Herrick Iron Works, Oakland; and C. W. Timmons, American Pipe & Steel Co., Alhambra, Cal.

THIS WEEK

ON THE

ASSEMBLY LINE

By W. F. SHERMAN

Detroit Editor

... Schedule reductions for February show effects as assemblies drop to 95,985 ... Inventories estimated at 400,000 new cars awaiting spring sales upturn ... Steel buying under way after prolonged wait for test ... Auto cooling systems sealed to build up pressure; 25-lb. maximum regarded as next step ... Auto show dates set for October again.

DETROIT—Feeling the effects of February reductions in assembly schedules, the automobile industry last week accounted for a total of only 95,985 cars and trucks, compared with 101,240 in the previous week, according to Ward's Automotive Reports. These figures are still substantially above the output in the corresponding week last year when 84,500 vehicles were built. Aside from holiday interruptions, this is the first important decrease since the period of labor trouble in the fall.

Expect Spring Sales Upturn

Packard resumed operations last week, after a temporary lapse, and the other independents continued at a slow pace. However, the significant changes were reductions by major producers. Ford-Mercury output dropped from 25,250 to the 20,000 mark; Lincoln-Zephyr, from 750 to 600; Chevrolet, from 23,000 to 22,000; Plymouth, from 12,700 to 11,840. Besides Chevrolet and Plymouth, other car building divisions of the two big corporations slipped somewhat with the result that GM's total decline in volume was from 39,564 to 38,295 while Chrysler totals dropped from 26,865 to 25,905.

It has been estimated that new car inventories throughout the nation have climbed near the 400,000 mark, indicating that the field is amply supplied for a "heavy" spring sales upturn. Current trimming of production schedules is intended to keep the new car inventory from growing, and final assembly lines are geared closely to current sales.

Ford Buys Steel

Considerable placing of steel tonnage with suppliers is expected shortly as an aftermath of the final closing on the Ford business which had been awaited for several weeks. However, it is reported that Fisher Body bought some sheets quietly in January and this firm of auto body builders is not expected to buy, at least not heavily, right away. Another Ford buy, regarded as relatively minor in nature, impends. Requirements for replacement parts, such as fenders, are due to be filled shortly. Tonnage estimates cannot be obtained at this early date.

From what is known in Detroit, the recent Ford buying activity brought out a full quota of bidders, all of whom have indicated that full published prices were submitted. Every direct indication leads to the conclusion that this purchase, popularly regarded as a "price test," established the general firmness of prices. Not until early this week were suppliers sure of their own standing, but it was apparent that the Dearborn requirements were split among a number of mills, possibly as many as 10. The requirements included considerably more than just sheets and strip, although these attracted the most attention.

Changes in Cooling Systems

Cooling systems of automobiles are undergoing changes predicted by experts many years ago. The most important of these is the use of "pressure" or what might be called semi-steam cooling systems. So far they have not received much publicity, but

two of these systems are known to be in use. Cadillac pioneered the use of the idea two years ago, and Buick is using it this year. An 8-lb. (sq. in.) system is the present version, but 25 lb. is regarded in some quarters as the next step.

Advantages include a sealing against loss of cooling liquid (water and anti-freeze), higher boiling point (270 deg. F., instead of the normal 180 deg. F.), greater engine (thermal) efficiency.

The system differs little from those already in common use. Radiator caps seal the system tightly, and there is no overflow pipe. A safety valve, rated at the desired blow-off pressure, is incorporated. Naturally all parts must be tested and capable of withstanding the greater pressures. Hose lines, etc., must not decrease in strength in any appreciable degree at the higher temperatures and pressures.

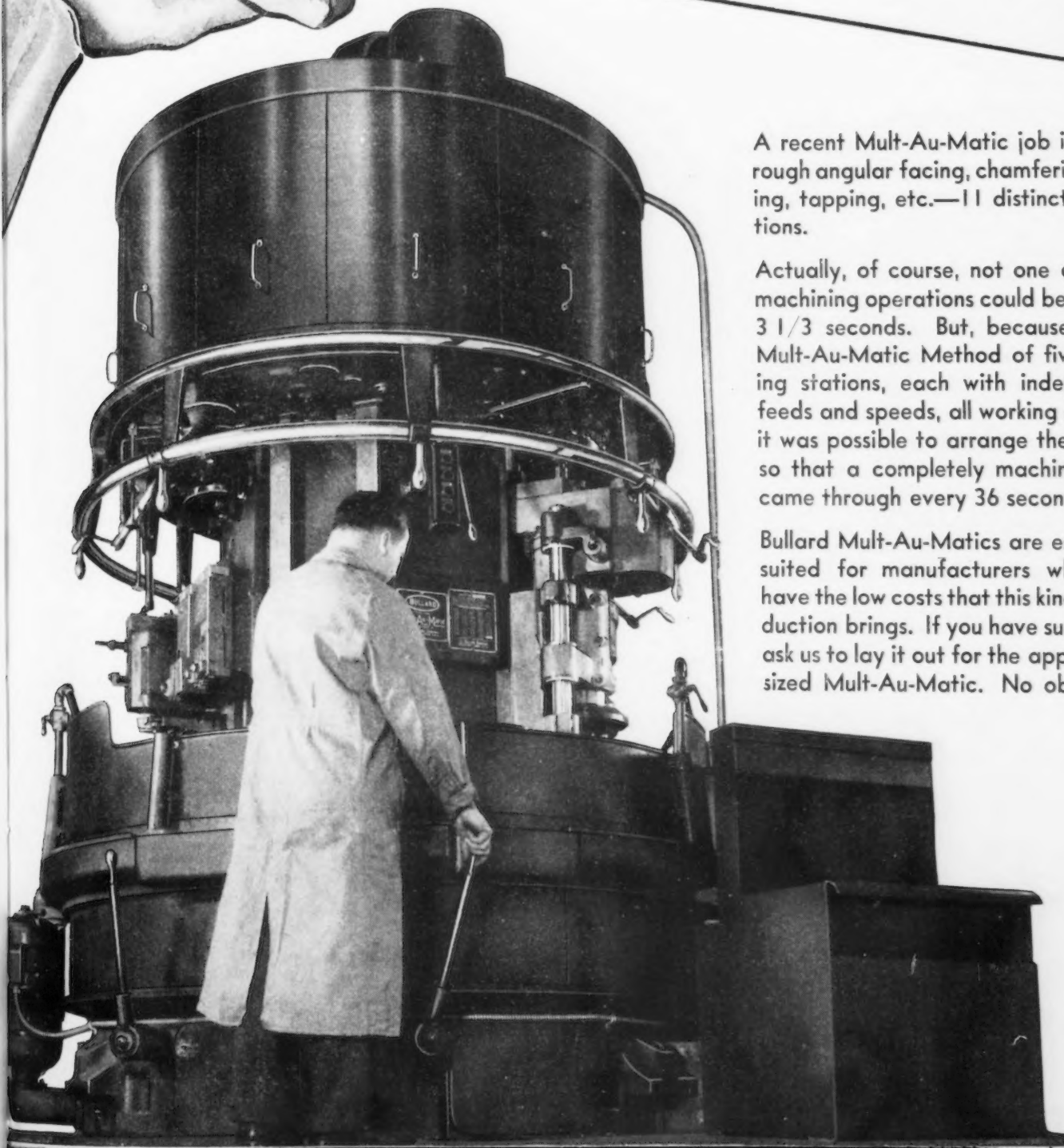
Auto Show Oct. 12-19

Closely corresponding with the dates of last October's auto show, the national exhibit at New York for 1941 models has been set for Oct. 12 to 19, it has been announced by the Automobile Manufacturers Association. This announcement sets at rest whisperings that the dealers would be deferred to, with a change to the January show dates which the organized dealers have advocated. If a change had been made, it would have altered considerably the tooling and die programs of the industry.

Michigan awards to a group of men designated "Modern Pioneers on the Frontier of Industry" are scheduled to be made Thursday night, Feb. 15, at Hotel Statler, Detroit. Names of those to receive the awards are to have been selected and made known in time for the ceremonies. While more than a thousand candidates' names were submitted to a committee of scientists headed by Dr. Karl T. Compton, president of Massachusetts Institute of Technology, it was confidently expected that names of men connected with the automobile industry would be well represented in the awards.



*3 1/3 Sec. each for
11 Operations*



A recent Multi-Au-Matic job involved rough angular facing, chamfering, boring, tapping, etc.—11 distinct operations.

Actually, of course, not one of these machining operations could be done in 3 1/3 seconds. But, because of the Multi-Au-Matic Method of five working stations, each with independent feeds and speeds, all working at once, it was possible to arrange the tooling so that a completely machined part came through every 36 seconds.

Bullard Multi-Au-Matics are especially suited for manufacturers who must have the low costs that this kind of production brings. If you have such a job, ask us to lay it out for the appropriate sized Multi-Au-Matic. No obligation.

THE BULLARD COMPANY
BRIDGEPORT, CONNECTICUT

Automotive Buying Procedures Differ From Those of Other Industries

DETROIT—Since sometime in January, Detroit has anticipated the events incident to the purchase of a large quantity of steel by one of the major automobile companies. During that time the usual number of wild guesses, strange rumors and misapplied information were in general circulation, so that in many respects the event was merely a repetition of an old cycle of occurrences. An observer finds it surprising that the repetition should be so stereotyped. That it was, is evidence that some study should be made of buying methods and procedures that are, of necessity, peculiar to this locality.

Circumstances have attached to the Ford Motor Co. buying of steel an especial significance. As a result, each time that it enters the market as a buyer, all eyes are focused on it. Now

By W. F. SHERMAN
Detroit Editor, *The Iron Age*

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that this "buy" has been made, a large amount of delayed buying is expected to be done by other automotive consumers; but certain phases of that "buy," entirely apart from what is commonly regarded as market information or price news, deserve comment.

It is not at all surprising that the periodic large purchases should attract a great deal of attention. And, since Detroit is without doubt one of the major rumor factories of the world, rivaling Wall Street, it is to be expected that rumors will deal with steel on these occasions. Frequently, how-

ever, this leads to the dissemination of some erroneous bits of information. Dressed in their Sunday-best and lavished with attention from all sides as they make their rounds, these rumors get far more credence than they deserve. Because rumors are sometimes harmful, they should be stripped of all verbiage and examined for truth. Facts are available, so this can be done.

This is not intended as a soul-searching study of automotive buying methods. It is only an attempt to analyze certain significant phases of Detroit buying and the following paragraphs will point out realistically some of the facts which should be apparent to those who have a stake in the automotive industry as suppliers.

Automotive Buying Is Complicated

First of all, automotive buying does not resemble railroad buying, for instance. There is no one in charge of "stores," preparing or handling requisitions or keeping inventory on stocks (except, of course, for non-productive requirements such as brooms, mops, pails and various maintenance supplies). Nor could automotive purchasing be compared with buying for a jobbing house, or retail sales organization, or typical manufacturing company.

Automotive buying is complicated by the seasonal and year-to-year variation in demand for cars, and by the presence of yearly model changes. A further complexity is introduced because auto builders buy many parts from outside sources. Sometimes many suppliers provide parts, more frequently only two or three are on the list, but in many cases two or three suppliers send in some of the requirements, while the auto manufacturer makes some of the parts himself.

Between auto companies there are differences that are important. For example, a central organization buys all Chrysler requirements. But in the General Motors Corp. each car-building division and others such as Ternstedt and the accessory divisions buy independently. Fisher Body division must buy autobody steel for all the car divisions, since it supplies bodies for all General Motors cars. Chevrolet buys bodies from Fisher, but pur-

(CONTINUED ON PAGE 64)

THE BULL OF THE WOODS

BY J. R. WILLIAMS



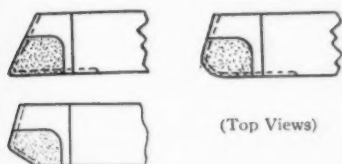
How To Make A Carboloy Tool

Do Triple Duty On Small Runs

Low tool inventory and broader use of Carboloy throughout your plant on small runs is possible when you take advantage of the unusual flexibility of Carboloy standard tools. Using rapid grinding procedure now available (Bulletin GM-36) tools may be quickly readjusted as often as desired to meet varied requirements. Thus tool cost is absorbed over many jobs instead of just one. For example, take the Style 4 tool shown below.



This Carboloy tool (one of 9 standard styles. Catalog M-37) may be economically reground to numerous shapes required. Three typical adaptations are shown below:—



Sheet Metal Draw Dies

The ability of Carboloy cemented carbide dies to produce an unusually fine finish and to hold work within extremely close size limits for long periods of operation is of particular value for sheet metal drawing. This is especially true on high-speed, quantity-production eyelet machines where

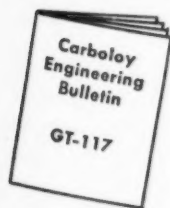


every minute of downtime means a production loss up to 300 pieces. Producers of eyelets for shoes, lamp bulb bases, lipstick tubes, charged water cartridges, pencil caps, radio tubes and many other uses are finding Carboloy dies of unusual value. Die sizes now in use for drawing non-ferrous and ferrous stock range from the smallest eyelet die up to 6" I. D.

New Engineering Bulletin Lists

Speeds, Feeds, Cuts For All Metals

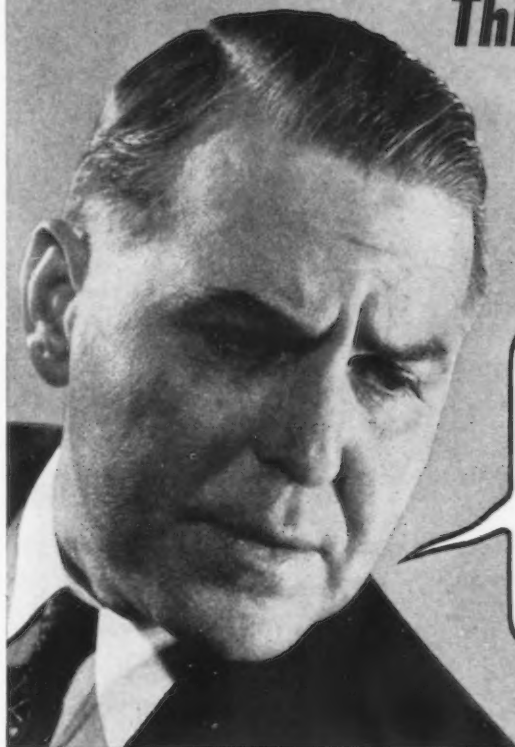
This new Carboloy Engineering Bulletin differs from ordinary bulletins in that it lists specific *starting* recommendations in addition to a general range of speeds. Also lists specific Carboloy grades for all metals and non-metallics and contains formula for calculating horsepower required. Ask for Bulletin GT-117



Carboloy Masonry Drills

Your maintenance man would like to know about the Carboloy Masonry Drill. Drills concrete, brick, tile, etc., 75% faster than old methods. Ask for leaflet GT-103.

Have You Ever Asked Yourself This Question?



Why can't we use Carboloy Tools on our small-run Job lot work?

Here Is a Practical Way To DO IT!

For those who want to use Carboloy on small, job-lot runs, there is a practical, economical method.

First step is to *forget about Carboloy grade selection!* A large inventory of various grades is unnecessary for small runs. Usually one general purpose grade for steel and one for all other metals and non-metallics will be adequate.

Second step is to select a limited number of general purpose styles and sizes of standard Carboloy tools. Make your selection such that tools can be widely employed in your shop. Flexibility of these tools is demonstrated by the Style 4 tool shown at left. Note the various shapes in which

this tool can be ground. All standard tools have this flexibility.

Third step is to apply the simple, rapid Carboloy tool grinding procedure introduced in 1936 and now widely used. With this method, simple adjustments in tool shapes can be rapidly made to prepare a tool for any job selected.

These three simple steps are now successfully followed by a large number of shops having small runs. Once established, you will receive benefits from Carboloy tool use comparable to those of production plants. We'd be glad to help you start to get these benefits.

CARBOLOY COMPANY, INC., 11153 E. 8 Mile Ave., DETROIT, MICHIGAN

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TUNGSTEN CARBIDE—TANTALUM CARBIDE—TITANIUM CARBIDE

★ FOR CUTTING, DRAWING, SHAPING, EXTRUDING METALS AND NON-METALLICS
★ FOR REDUCING WEAR ON EQUIPMENT OR PRODUCTS YOU USE OR MAKE ★

THIS WEEK IN WASHINGTON

*... Lewis charges anti-labor collusion to kill Wagner Act ...
Bill curbing New Deal bureaucracy has chance of passage ...
U. S. Housing Authority approves more loans.*

By L. W. MOFFETT
The Iron Age

WASHINGTON — The CIO chant against AFL and "reactionary and anti-labor" collusion to scuttle the Wagner Act was sounded anew by CIO Generalissimo John L. Lewis last week as the special House committee investigating the labor board voted to ask Congress for \$50,000 additional to keep the NLRB in hot water by continuing the widely-publicized House inquiry.

Philip Murray, SWOC chairman, appeared before the Senate Labor Committee to protest against proposed Wagner Act amendments sought by the AFL and by the National Association of Manufacturers, and gave the committee what he described as "documentary proof" from Mr. Lewis that the American Federation of Labor proposals to modify the Wagner Act were prepared with the aid of attorneys for "reactionary and anti-labor corporations."

Meetings Alleged

The voluminous report from the CIO chieftain charged among other things that AFL General Counsel Joseph A. Padway prepared the federation amendments after a series of secret conferences with Gilbert H. Montague of New York, Earl Reed of Pittsburgh and Ernest S. Ballard of Chicago—three lawyers who were characterized by the CIO exhibit as representatives of "many corporations which have been the most flagrant and notorious violators of the National Labor Relations Act."

Mr. Lewis, specifically listing 14 companies which he said were represented by the three attorneys, included Weirton Steel Co., Columbian Enameling & Stamping Co., Inland Steel Co., Borg-Warner Corp., Youngstown Sheet & Tube Co., In-

ternational Harvester Co., Link-Belt Co., Electric Boat Co., Standard Steel Works and Baldwin Locomotive Works.

La Follette Findings Cited

"The anti-labor activities of many of these corporations," Mr. Lewis' report said, "have been revealed through the La Follette Civil Liberties Committee, which disclosed their widespread industrial espionage and purchase and use of guns and ammunition in industrial disputes. These same corporations and their executive heads, have also been active members of the National Association of Manufacturers and actively participated in the determination of the policy of the NAM to advise industry generally to deliberately violate the National Labor Relations Act."

Announcement by the special House committee that it was seeking \$50,000 more to continue its searching investigation of the labor board came as a surprise to some observers who expected the committee to close its books shortly and report to the House. The committee's original appropriation of \$50,000 is virtually exhausted with only \$10,000 remaining as of Feb. 1.

Pressure On Congress

After developing testimony on lobbying activities of the NLRB, the Smith committee ordered subpoenaed all correspondence relating to such functions in regional offices of the labor board. Board Chairman J. Warren Madden, who testified that he saw nothing wrong in government employees attempting to protect a law against attack, conceded that regional directors had been active in bringing pressure to bear on Congress to pass adequate appropriations for the NLRB.

Mr. Madden's attempt to gloss over the board's lobbying activities by insisting there was nothing irregular was interpreted in some quarters as indicative that the practice is so widespread among government bureaus in Washington that it is considered by key New Dealers to be completely innocuous. Reprehensible as the practice may be to those outside the government who have been constantly warned by New Deal spokesmen against lobbying, the fact remains, according to the Smith committee testimony, that the present labor board considers lobbying for itself justified where necessary to preserve a tribunal from extinction by Congress.

A "Little Work" Suggested

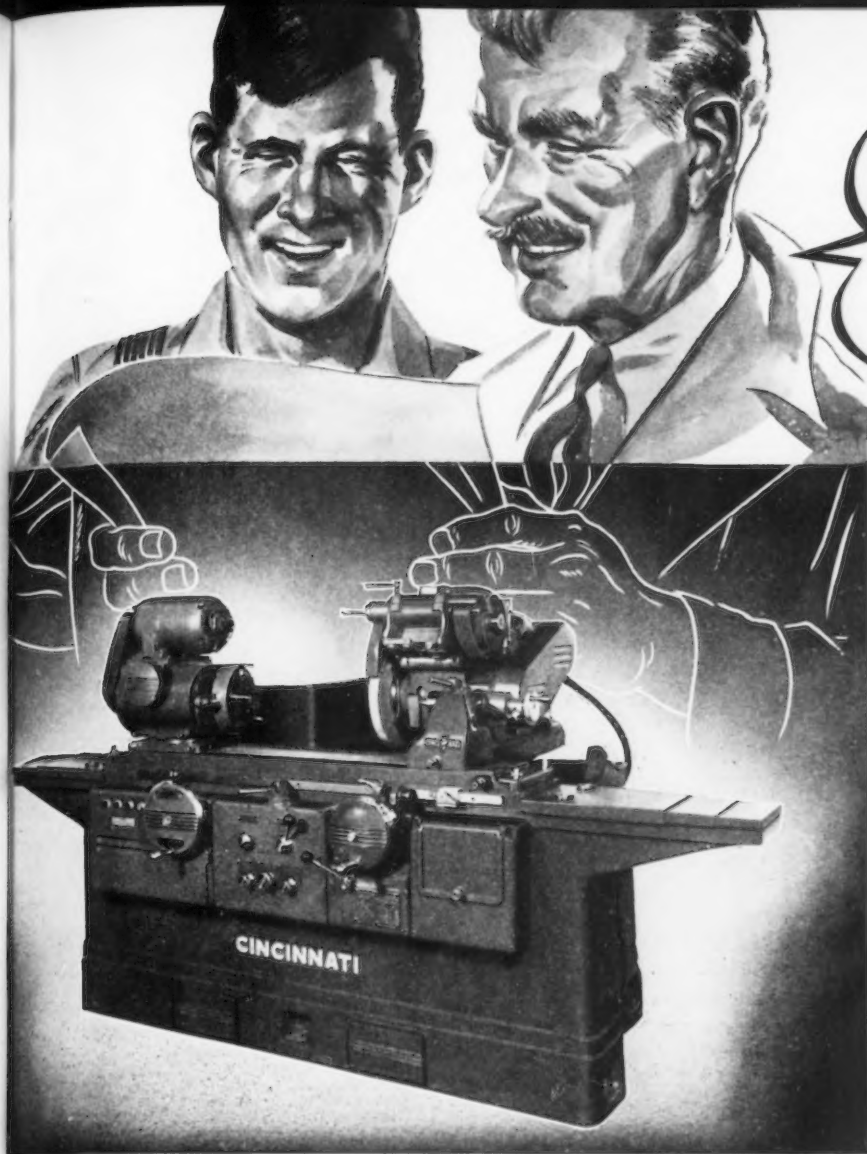
The committee learned from its counsel, Edmund M. Toland, that Mr. Madden told a conference of NLRB regional directors in the fall of 1938:

"It occurred to me that a little work might be done all the time on our relations with Congress in this way: Instead of on the critical day—the ratification of the appointment of a member of the board or any other legislative proceeding—that probably these Congressmen keep the files on various subject matters, and it might have at least as much effect on them and it might irritate them less if they were getting through the mail a somewhat deliberate letter now and then from a labor organization, or people of substance in communities, about the work of the board.

"I should think if that word was passed on to our friends in the labor movement and elsewhere that they would write to their Representatives or their Senators, giving their opinion at some length about the work of the board. Probably these letters would get into the files, and when our critical situations come up in Congress, the Congressman's secretary would dig out that file and would let the Congressman know that we did have friends. As it is now, we have a rush at the last minute—a lot of telegrams, quite obviously solicited, and the effect on people who are not otherwise friendly to us is the effect of irritation at being put under pressure."

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fore Congressional hearings, Mr. Madden admitted it was a problem how far employees of a government agency should go toward protecting an act from attack, but he added that he considered the administrators of such an agency had the duty of guarding the law against its enemies as well as enforcing it. When an amendment to the law is proposed, board members ask permission to go before the Congressional committee which, Mr. Madden said, might be construed as a form of lobbying.

Tactics of Obstruction

Mr. Toland read into the record a memorandum sent out to all CIO affiliates by SWOC General Counsel Lee Pressman, advising them, in view of "the tactics of obstruction" by employers and the delays in adjudicating cases, to concentrate on large employers even if they had to take up cases of single employees. By bringing "the dominant corporations" into line, Mr. Pressman's letter said, "the smaller employers will give up without a fight."

As a result of this memorandum, the testimony showed, NLRB Secretary Nathan Witt sent copies to the board's regional directors, noting that the NLRB was "sympathetic with the policy expressed in this circular and is sure that it should be helpful in your relations with representatives of the CIO."

Shortage of Plane Engines Nearing End

WASHINGTON — Further than the statement of Secretary of the Treasury Morgenthau that the so-called "potential bottleneck" in airplane production was well on the way of elimination, nothing was given out for publication regarding the meeting which Mr. Morgenthau held here last Wednesday with airplane engine and machine tool builders. The conference followed two held the previous week at which delayed deliveries of machine tools for engine makers were discussed and machine tool manufacturers voluntarily agreed to give priority to engine and aircraft builders engaged on American national defense contracts.

The feeling prevails among some Administration officials that expanded airplane production facilities, financed by foreign capital to meet allied demands, would result in a collapse upon termination of the war and of foreign purchases. Mr. Morgenthau said he was going to "let the industry do its own policing" with regard to both the expansion of capacity and working out

a system of priority as between domestic and foreign purchases.

Secretary Morgenthau indicated that American airplane engine productive capacity had risen to 1000 motors monthly, with an average of 1000-hp., that by mid-July capacity will be 1500 a month and that by the end of 1940 it will be further increased to 2000 monthly. A French contract with Pratt & Whitney was said to call for 2250 engines by the end of the present year during which period deliveries to both France and Great Britain are expected to total 7000 American engines, representing approximately half that number of airplanes.

It was estimated that the United States will produce about 15,000 motors in the present year, between 7500 and 8000 to be needed by the Army, Navy, commercial interests and for commercial export.

\$1,000,000,000 in Raw Material

Mr. Morgenthau, who is liaison officer between the White House and the President's interdepartmental committee set up to prevent conflict between foreign buying and American Army and Navy requirements, made these remarks following a meeting last Thursday called by the President, and attended by heads of the State, War and Navy Departments which, among other things, dealt with foreign purchases of war supplies and the sale of surplus Army and Navy guns to Scandinavian countries.

It is said that the meeting was inspired chiefly by reason of concern that heavy purchases by foreign countries might develop a sharp rise in prices of both raw and manufactured products needed by the War and Navy Departments and thus conflict with the effort of the President to prevent such a situation. No conclusions are said to have been arrived at but it was stated the subject is being closely watched.

Reports are current that Great Britain proposes purchases totaling some \$1,000,000,000 in raw materials, airplanes, ships and other requirements and these purchases are said to have been discussed.

Several thousand field guns and approximately 2,000,000 rifles are included in surplus war materials which, it is said, a Scandinavian purchasing commission proposes to buy through an Export-Import Bank loan. The Administration has asked Congress to increase the bank's revolving fund by \$100,000,000.

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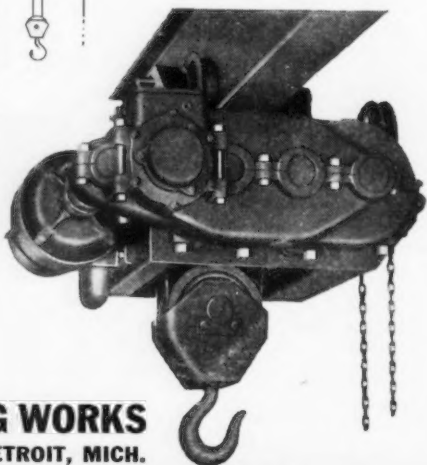
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Manganese Ore Stocks In U. S. Have Increased

WASHINGTON—According to data supplied by the Bureau of Foreign and Domestic Commerce, December imports for consumption of manganese ore containing 35 per cent or more manganese were 102,390 gross tons containing 50,368 tons of manganese. Of the imports in December, the Gold Coast supplied 27 per cent, the U. S. S. R. 21 per cent, Cuba 17 per cent, British India 15 per cent, Brazil 10 per cent, and the Philippine Islands 7 per cent. In addition, 12,260 tons containing 3555 tons of manganese (29 per cent Mn) were entered from the Union of South Africa in December. For the year 1939, imports for consumption were 627,129 tons containing 313,810 tons of manganese, of which the Gold Coast supplied 39 per cent, the U. S. S. R. 21 per cent, Cuba 17 per cent, British India 14 per cent, and Brazil 7 per cent. In addition, 30,684 tons containing 8898 tons of manganese (29 per cent Mn) were entered from the Union of South Africa.

According to data of the Bureau of Foreign and Domestic Commerce, stocks of manganese ore in bonded warehouses as of Dec. 31 amounted to 900,436 tons containing 441,806 tons of manganese compared with 887,720 tons containing 437,323 tons of manganese as of Nov. 30 and with 842,048 tons containing 418,721 tons of manganese at the beginning of 1939.

Industrial Researchers Quadrupled Since 1929

WASHINGTON—A WPA white-collar project report showed this week that the number of persons engaged in industrial research—laboratories from which the bulk of new inventions and improved processes have come in recent years—has increased fourfold since 1929 with 50,000 employees at present and annual expenditures averaging between \$150,000,000 and \$200,000,000.

More USHA Loans Approved

WASHINGTON—The United States Housing Authority, approaching the \$600,000,000 mark in loan contracts to local housing authorities for construction of low-rent projects, last week approved loans totaling \$15,857,000 for projects in 12 communities.



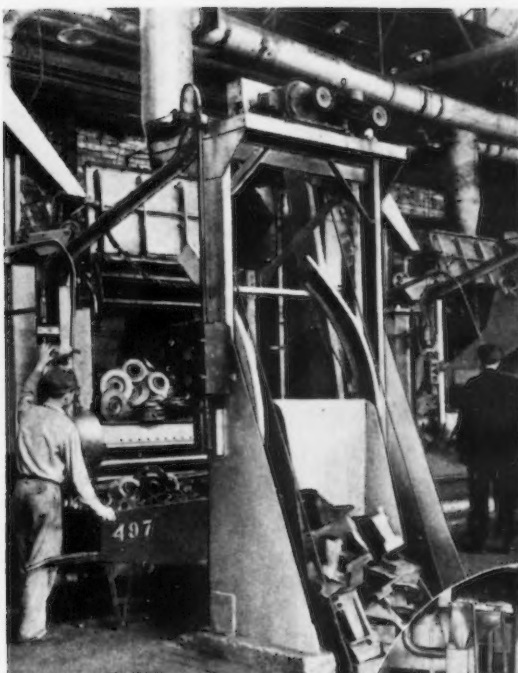
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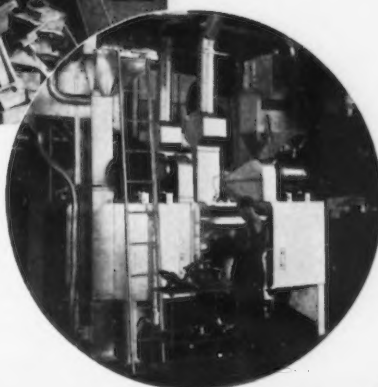
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A PROMINENT motor car manufacturer's* experience with several WHEELABRATOR machines led to the purchase of an additional unit recently despite the fact that it was not provided for in the 1940 budget. The purchase requisition for this equipment read: "Not included in 1940 program, but an improvement necessary for quality."

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Fate of Bill Curbing New Deal Bureaucracy Still in Doubt

WASHINGTON — Despite tremendous Administration pressure to block it, present indications are that Congress will pass the Logan-Walter bill to curb activities of the New Deal bureaucracy. It is reported that the new strategy of the bureaucrats is to keep the measure off the floor as long as possible and in the meantime lobby against it in the hope that they can narrow the margin of votes for its passage sufficiently to have it killed by a Presidential veto. If brought up at an early date the legislation might be passed by a wide margin. Whether it can be delayed further, the vote cut down, and the bill finally killed, if vetoed, is a matter of speculation.

From the outset the Administration forces have tried to head off the legislation, sponsored in the Senate by the late Senator Logan, Democrat of Kentucky, and in the House by Representa-

tative Walter, Democrat of Pennsylvania. Except for technical phraseology in some provisions, the bills are similar. While in different form than the present Logan-Walter bill legislation to establish uniform rules of administrative procedure has been proposed for many years. The New Deal claims to favor the suggestion for uniformity of rules but insists that the Logan-Walter bill is too stringent and at hearings and on other occasions has vigorously attacked it.

Opponents Seek Delay

Only 10 days ago, when efforts were being intensified to get the House Committee on Rules to report out a rule for the measure, the Department of Justice, in a well-timed report, seeking to hold up the bill, said that uniform procedural standards for administrative agencies would tend to defeat the purposes of many Congressional enactments. The Attorney Gen-

eral's committee on administrative procedure, appointed more than a year ago to "study" the subject and head-off the Logan-Walter measure, implied that Congress should delay action on it until the committee could complete studies on the scores—actually some 130—government agencies exercising quasi-judicial functions and hold hearings.

The committee said its studies had reinforced the skepticism that a single formula can properly control "the various and changing situations in which administrative action is present." Improved procedure in the multiplicity and maze of bureaus was also reported, as might have been expected since the investigators consisted of representatives of the "investigated" bureaus.

The answer of the House Committee on Rules, despite opposition of its chairman, Representative Sabath of Illinois, 100 per cent New Dealer, came three days after the Department of Justice made public the administrative committee report. The House Committee cleared the way for the Logan-Walter bill, which would subject the orders and regulations of all Federal Bureaus to the review of the courts.

May Be Passed In House

It is said that the bill may not get to the House floor for a week or longer but that once it does it will be passed regardless of Administration moves against it, though delay may result in cutting down the margin by which the measure is expected to be passed in that branch of Congress. Meanwhile, moves are being made to bring the measure to the Senate floor, where passage also is predicted. Technically the bill is on the Senate calendar inasmuch as it passed the Senate at the previous session, when Majority Leader Barkley, Democrat of Kentucky, was caught off-guard. His colleague, Senator Logan, succeeded in getting the bill passed by unanimous consent.


The New Deal forces rallied from their consternation when Senator Minton, Democrat of Indiana, asked that the vote be reconsidered.

In a rather caustic report on the bill the House Judiciary Committee, after observing that there are approximately 130 Federal agencies in the government, added: "The law must provide that the governors shall be governed and the regulators shall be regulated, if our present form of government is to endure.

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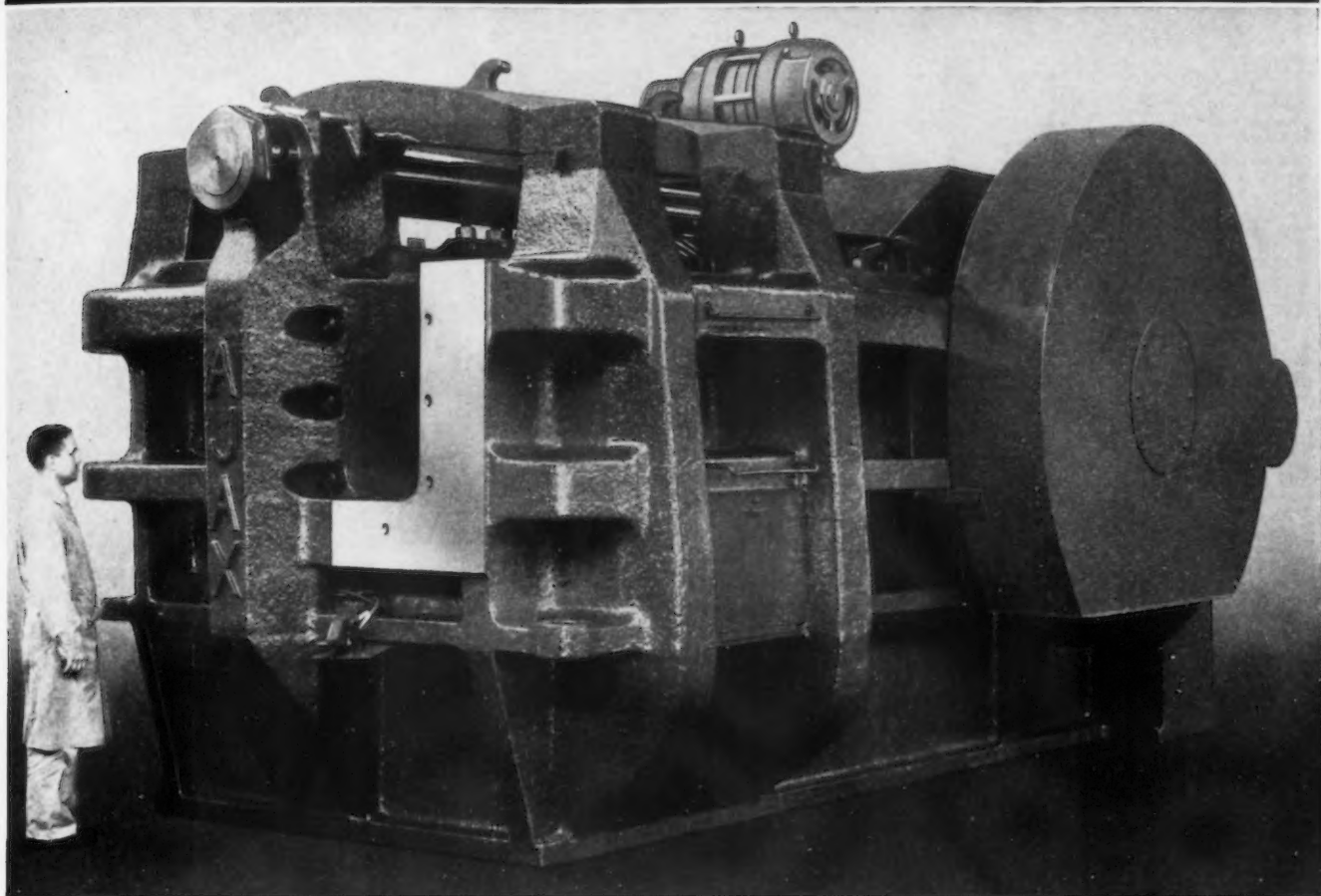


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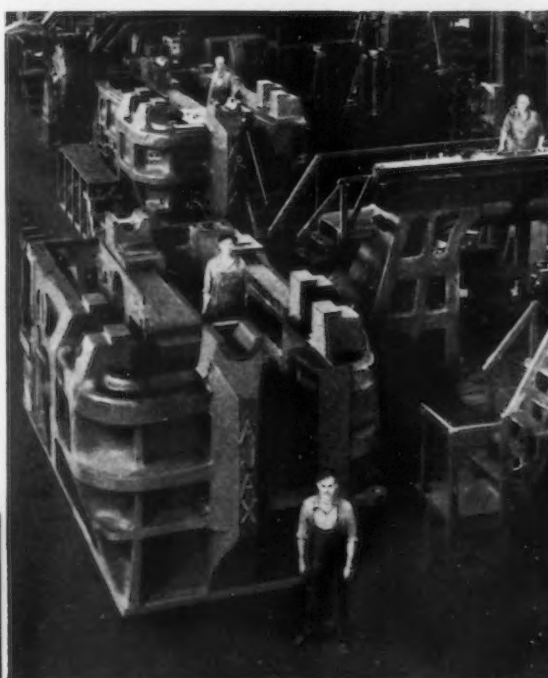
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Awards by Navy, War Departments

WASHINGTON—The War Department last week announced the award of \$1,472,530 in contracts under the Army's educational orders program to these companies:

For fuses, metal components and related items—National Cash register Co., Dayton, Ohio, \$70,132; Fulton Syphon Co., Knoxville, Tenn., \$101,991; Federal Screw Works, Detroit, \$72,040; Philadelphia Storage Battery Co., Metal Stamping Division, Philadelphia, \$133,485.

For boosters, metal components and related items—Electric Household Utilities Corp., Hurley Machine Division, Chicago, \$42,656; National Pneumatic Co., Rahway, N. J., \$62,745; Wright Machine Co., Worcester, Mass., \$74,238; Federal Screw Works, Detroit, \$59,795; Warren Webster & Co., Camden, N. J., \$34,551; Sunbeam Electric Mfg. Co., Evansville, Ind., \$77,799.

Cummings Machine Works, Boston, ranges, quadrant, and related items, \$51,587; American Car & Foundry Co., Berwick, Pa., ammunition, \$81,167; Consolidated Steel Corp., ammunition, \$109,626; Corbin Screw Corp., New Britain, Conn., fuses and related items; Harrington & Richardson Arms Co., Worcester, Mass., automatic pistols and related items, \$192,497; Singer Mfg. Co., Ellizabeth, N. J., automatic pistols and related items, \$278,875.

The Bureau of Reclamation has awarded a \$105,127 contract to National Electric Products Corp., Pittsburgh, for 2,040,000 ft. of 1-in. black steel pipe and 35,900 bends for Friant Dam, Central Valley Project, Cal. The pipe, to be used

in cooling the concrete while it sets, will remain in the dam permanently.

The Navy Department's Bureau of Supplies and Accounts has awarded contracts to these companies:

Debevoise-Anderson Co., Inc., Newark, N. J., pig iron, \$5,104; Benson Electric Co., Superior, Wis., steering engines, \$8,410; Carnegie-Illinois Steel Corp., Pittsburgh, steel bar, \$6,616; Bethlehem Steel Co., Bethlehem, Pa., bar steel, \$14,028; Keystone Drawn Steel Co., Spring City, Pa., bar steel, \$7,041; The Cleveland Automatic Machining Co., Cleveland, automatic screw machine, \$6,958.

Brown & Sharpe Co., Providence, R. I., milling machine, \$7,326; Yale & Towne Mfg. Co., Stamford, Conn., locks, \$14,864; William Sellers & Co., Inc., Philadelphia, openside planer, \$47,900; Buffalo Pumps, Inc., Buffalo, N. Y., centrifugal pumps, \$13,080; Reed & Prince Mfg. Co., Worcester, Mass., screws, \$27,064; The American Tool Works Co., Cincinnati, drill press, \$5,366.

Lukens Steel Co., Coatesville, Pa., steel plate, \$10,651; Kennecott Sales Corp., New York City, ingot copper, \$11,530; and \$57,650. Bethlehem Steel Co., San Francisco, steel, \$11,775; Keystone Drawn Steel Co., Spring City, Pa., steel, \$8,403; The Lodge & Shipley Machine Tool Co., Cincinnati, lathes, \$9,898; The International Nickel Co., New York City, nickel-copper alloy, \$13,909; American Steel & Wire Co. of New Jersey, Washington, D. C., wire rope, \$5,083; Westinghouse Electric & Mfg. Co., Pittsburgh, portable welders, \$5,370; The R. K. LeBlond Machine Tool Co., Cincinnati, lathe, \$5,068; General Electric Co., Schenectady, N. Y., locomotive, \$49,818.

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., hydraulic press, \$10,773; John A. Roebling's Sons Co., Trenton, N. J., wire rope, \$8,668; General Machinery Corp., Hoooven Owens Rent-schler Division, Hamilton, Ohio, engine parts, \$9,697.

Government Awards

WASHINGTON — Government contracts for iron and steel products as reported by the Labor Department's Public Contracts Division for the week ended Jan. 20 totaled \$934,502. Contracts for non-ferrous metals and alloys reported during the same period amounted to \$567,373, and for machinery, \$533,165. Details follow:

Iron and Steel Products

Massachusetts Gas & Electric Light Supply Co., Boston, Navy S&A, conduit pipe	\$40,355
Triangle Conduit & Cable Co., Moundsville, W. Va.; Camden Forge Co., Camden, N. J., Navy S&A, roller tracks	384,900
Central Iron & Steel Co., Harrisburg, Pa., Navy S&A, steel plates	Indefinite
Wayne Tool Co., Waynesboro, Pa., Navy S&A, reamers & countersinks	12,754
Noland Co., Inc., Washington, D. C., Panama Canal, pipe fittings	17,817
Duffin Iron Co., Chicago, Panama Canal, structural steel	22,100
Bethlehem Steel Co., San Francisco, Interior Reclamation, reinforcement bars	11,486
Columbia Steel Co., San Francisco, Interior Reclamation, reinforcement bars	29,125
C. J. Rainear & Co., Inc., Philadelphia; Taylor Forge Works, Chicago, Panama Canal, wrought iron pipe ..	11,100
American Bridge Co., Gary, Ind., TVA, lock gates	248,430
Crescent Tool Co., Jamestown, N. Y., War Air Corps, pliers	12,072
Peco Mfg. Corp., Philadelphia, Ordnance War, machining forgings ...	75,900
Carnegie-Illinois Steel Corp., Chicago, Ordnance War, carbon steel	12,054
The Atwater Mfg. Co., Plantsville, Conn., Ordnance War, steel forgings ..	26,371
Majestic Mfg. Co., St. Louis, War QMC, gas ranges	20,455
Noland Co., Inc., Washington, D. C., Naval Power Factory, pipe & pipe fittings	10,479

Non-Ferrous Metals & Alloys

Federated Metals Division, American Smelting & Refining Co., San Francisco, Navy S&A, bronze manganese ..	\$22,400
Kennecott Sales Corp., New York City, Navy S&A, copper ingot ...	107,491
Hudson Smelting & Refining Co., Newark, N. J., Navy S&A, pig lead ..	27,639
North American Smelting Co., Inc., Philadelphia, Navy S&A, pig lead ..	38,610
Aluminum Co. of America, New Kensington, Pa., Navy S&A, aluminum Division Lead Co., Chicago, Navy S&A, pig lead	40,185
The International Nickel Co., Inc., New York City, Navy S&A, nickel-chromium-alloy	11,340
Chase Brass & Copper Co., Inc., Waterbury, Conn., Ordnance War, cartridge brass cups	76,360
The International Nickel Co., Inc., New York City, Puget Sound Navy Yd., nickel-copper-aluminum-alloy ...	21,406
The International Nickel Co., Inc., Huntington, W. Va.; Revere Copper and Brass, Inc., Baltimore, Panama Canal, brass, copper	15,160
The Harvey Metal Corp., Chicago, Ordnance War, brass forgings	23,865
Mueller Brass Co., Port Huron, Mich., Ordnance War, brass forgings	107,550
Ostby & Barton Co., Providence, R. I., War QMC, collar insignia	31,983
Henry Moss and Co., Inc., Brooklyn, N. Y., War QMC, cap insignia ...	10,057

Machinery

Sherwood Brass Works, Detroit, Norfolk Navy Yd., diesel engine parts ..	\$18,400
The Buda Co., Harvey, Ill., Norfolk Navy Yd., diesel engine parts	18,623
W. E. Shipley Machinery Co., Philadelphia, Navy S&A, planer	17,121
William Sellers & Co., Inc., Philadelphia, Navy S&A, planer	29,512
The Cooper Bessemer Corp., Mt. Vernon, Ohio, Navy S&A, diesel engine ..	36,731
Lucian Q. Moffitt, Inc., Akron, Ohio, Norfolk Navy Yd., bearings	21,040
Northwest Engineering Co., Chicago, Panama Canal, crawler units, shovel ..	57,465
American Bosch Corp., Springfield,	

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This test
CHANGED
 chain
 design



This destruction test, pictured above, made during 1934, opened new fields for applications of long pitch chains, where maintained accuracy is vital in transmitting power. The properties of Nickel alloy steels, with their high strength/weight ratio, permitted modern redesigning which cut weight—and costs—over heavier chains formerly forged from plain carbon steel. This 10" link showed an ultimate strength of 455,000 lbs., a yield point of 388,000 lbs. — 30% higher than U. S. Engineer specifications.

Roller chains, with $12\frac{1}{4}$ " pitch, control roller gates on Mississippi River Dam 14, LeClaire, Iowa. Link-Belt Company used Nickel alloy steels to specifications of U. S. Engineer Office. Side bars are SAE 3140, Brinell 300-341, rollers SAE-3140, 300-341 Brinell, and pins SAE 3245, 340-380 Brinell. Triple width assemblies have an estimated ultimate strength of 2,250,000 lbs.

Dams on the upper Mississippi control water levels to provide navigable channels and guard against sudden floods. Dam gates are moved by roller chains of Nickel alloy steels. On hard jobs you can safeguard performance, keep costs down, by specifying Nickel alloy steels for all highly stressed units.



THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.



● Shaft 57 feet long, largest diameter 11¾ inches, weight 17,300 pounds
—forged and rough machined by Standard Steel Works Company.

STANDARD is equipped to produce steel forgings and castings of any size and shape to suit your requirements. . . . The steel used in Standard's forgings and castings is acid open hearth, produced in our own furnaces under close metallurgical control.

CASTINGS • FORGINGS • WELDLESS RINGS • WROUGHT STEEL WHEELS

STANDARD STEEL WORKS CO.

Subsidiary of
THE BALDWIN LOCOMOTIVE WORKS

P H I L A D E L P H I A



Mass., Norfolk Navy Yd., diesel engine parts	32,150
The Thew Shovel Co., Lorain, Ohio, Panama Canal, crawler units, shovel	59,400
T. W. & C. B. Sheridan Co., New York City, GPO, covering machine, Baldwin-Southwark Corp., Eddystone, Pa., Interior Reclamation, governors	29,038
The C. S. Johnson Co., Champaign, Ill., Interior Reclamation, concrete batching & mixing equipment	11,447
The Snow & Petrelli Mfg. Co., New Haven, Conn., Norfolk Navy Yd., diesel engine parts	43,998
Ingersoll-Rand Co., Washington, D. C., Panama Canal, air compressors	14,750
Barber Greene Co., Aurora, Ill., TVA, conveyor parts	15,928
Heyl & Patterson, Inc., Pittsburgh, Maritime Comm., gantry cranes	83,110

War Department Contracts

WASHINGTON—The War Department awarded contracts to the following companies during the two-week period ended Jan. 31:

Steel bar for shot—Allegheny Ludlum Steel Corp., Watervliet, N. Y., \$19,173; Crucible Steel Co. of America, New York, \$17,768; Bethlehem Steel Co., Bethlehem, Pa., \$19,600; Carpenter Steel Co., Reading, Pa., \$17,763.

Mueller Brass Co., Port Huron, Mich., brass forgings for ring, upper and graduated time trains, \$26,600; E. I. du Pont de Nemours & Co., Wilmington, Del., metal, \$15,050; Bausch & Lomb Optical Co., Rochester, N. Y., sights and spare parts, \$121,555; Poor & Co., Canton (Ohio) Forge & Iron Works, forgings for recoil mechanisms, \$5967; forgings for combat cars, \$3378.

York Safe & Lock Co., York, Pa., machine gun cradle assemblies, \$57,050; James Cunningham Son & Co., Rochester, N. Y., machine gun carriage assemblies, \$63,856; Lindberg Engineering Co., Chicago, furnaces, \$10,760; Noble & Westbrook Mfg. Co., East Hartford, marking machines, \$8600; Electric Arc Cutting & Welding Co., Newark, N. J., arc welders, \$3680; Federal Machinery Sales Co., Chicago, drilling machines, \$1124.

Pratt & Whitney division, Niles-Bement-Pond Co., Hartford, Conn., drilling machine, \$12,560; Marshall & Hushcart Machinery Co., Chicago, shaper, \$3012, surface grinder, \$1218, universal grinders, \$6492; Rasmussen Machine Co., Inc., Racine, Wis., power hack saws, \$2068; Continental Machines, Inc., Minneapolis, band saw, \$2536; R. K. LeBlond Machine Tool Co., Cincinnati, heavy engine lathe, \$6899; Monarch Machine Tool Co., Sidney, Ohio, heavy duty engine lathes, \$9728.

Hardinge Brothers, Inc., Elmira, N. Y., 6-in. bench lathe, \$1323; Rivett Lathe & Grinder, Inc., Brighton, Mass., precision bench lathes, \$6519; Barker Tool & Die & Gage Co., Detroit, gages, \$1243; Sharpsville (Pa.) Steel Fabricators, Inc., cylindrical tanks, \$84,700; Bendix Aviation Corp., South Bend, Ind., carburetor assemblies, \$84,449; General Electric Co., Schenectady, N. Y., supercharger assemblies, \$332,800.

North American Aviation, Inc., Inglewood, Cal., aircraft maintenance parts, \$155,432; United Aircraft Corp., Hamilton Standard Propeller Division, East Hartford, Conn., propeller assemblies and controls, \$61,720; American Steel & Wire Co., Columbus, Ohio, flexible cable, \$25,943; Greenville (Pa.) Steel Car Co., steel sheathed, 40 in., standard gage, railroad flat cars, \$61,032; Haffner Thrall Car Co., Chicago, 40 in. standard gage, railroad flat cars, \$11,724.



When Peace Comes

...life in the Old World will resume its normal course. Men will think of the pressure of things undone...of waste that must be reclaimed...of exhausted resources to be replenished. Men's attention will turn to advanced ingeniously designed machines which will help raise the standard of living by performing miracles of production at lower-than-low costs. Then, civilization may blueprint its tomorrows and march forward to a healing future. The Monarch Machine Tool Co., Sidney, Ohio.

Monarch
Lathes

Head Protection and Easy Comfort YOU GET **BOTH** WITH **M.S.A SKULLGARDS**



Today's standard work hat, around open hearths, blast furnaces, and in maintenance work . . . wherever head *safety* is a vital consideration and head *comfort* demanded. Skullgards are strong, light, easy on the head as an old felt hat, and they *do* protect . . . from falling objects, painful bumps . . . all the daily head hazards of the job. Let us send you a detailed M.S.A. Skullgard description — write for Bulletin B-DK-6.



MINE SAFETY APPLIANCES COMPANY

BRADDOCK, THOMAS AND MEADE STREETS, PITTSBURGH, PA.

District Representatives in Principal Cities

M. S. A. Products include: Breathing Apparatus... Inhalators... Approved Dust Respirators... Masks of all Types... Gas Indicators... Gas Detectors... Safety Goggles... Protective Hats and Caps... Edison Electric Cap Lamps... Safety Belts... Safety Clothing... Dust Instruments... First Aid Equipment. Descriptive Bulletins will be sent on request.

Iron Alloy Group Ends 10-Year Study; Monographs Issued

WITH the cooperation of 88 manufacturers, research institutes, technical societies, and Federal bureaus, and at a cost of \$271,700, the Iron Alloys Committee of the Engineering Foundation, New York, has assembled for American industry hitherto inaccessible information from the scientific and technical literature of many nations.

First critical review of its kind ever attempted, the work will be of incalculable value to the industries producing and consuming steel, according to a recent report of the committee, which has just completed 10 years of research. Some 10,000 papers have been read and 20,000 abstracts have been prepared. Out of this mass of material, embracing international progress recorded since 1890, 10 monographs containing 5630 pages and two and one-half million words have been issued.

This review of the literature includes data on the alloys of 40 elements with iron, in 20 classifications covering all phases of the manufacture, constitution, and properties of high-purity iron and plain and alloy steels and cast irons.

Monograph Revisions Planned

Four additional monographs are planned. The original program of the alloys of iron research will be finished early in 1943. The committee recommends that thereafter an annual appropriation of about \$15,000 be made so that the monographs may be revised and brought up to date at regular intervals.

"This cost spread equitably among some 50 large producers and users of alloy steels and cast irons," the committee explained, "would be of small moment compared with the benefits and savings accruing to industry at large, especially to research workers, engineers and others who must know the state of the art in their respective fields."

The program of the Iron Alloys Research Committee was planned broadly so that, by the publication of the monography series, metallurgists and other research students would be spared the labor and time necessary to search the literature in many languages to discover what had already been done in their fields, and so that costly research work that duplicated research already completed, but re-

ported in other languages or in obscure journals, could be prevented.

In addition it was planned that these monographs should supply in compact and readily usable form, all important data on the properties of present-day ferrous materials, to engineers and others making or using steel and cast iron.

Southern Railroads Ask Rate Cuts on Steel

WASHINGTON—Ranging up to 15c. per 100 lb., carload minimum 70,000 lb., rate reductions on iron and steel products moving to Gulf ports have been asked by Eastern and Southern railroads in an application filed with the Interstate Commerce Commission. At present the rates are generally subject to a carload minimum of 36,000 lb. The cuts are sought through relief from provisions of the long-and-short haul clause. The rail carriers said that the purpose is to meet water competition, especially that of private barges.

The affected ports are New Orleans, La.; Gulfport, Miss.; Pensacola, Fla., and Mobile and Pascagoula, Ala. If the application is granted, the rate from Birmingham, Ala., to New Orleans would be reduced from 37c. to 22c. while from Birmingham to Mobile it would be cut to 19c. Also contemplated, in order to meet market competition, are rate reductions of 15c. from St. Louis, Mo.; East St. Louis, Ill.; Ohio River crossings; Virginia-Maryland gateways and points in official territory, including Illinois.

Japan to Import Coal From Canada, India

WASHINGTON—Japanese authorities are said to have made arrangements to import immediately 50,000 tons of coal from Canada and India each, according to a report received from the office of the American Commercial Attaché in Tokyo, which says that due to depleted coal supplies, electric power shortage in Japan has become so acute that large factories are operating three days out of four and the smaller plants are not permitted to operate at night. The report adds that a complete breakdown of the power supply of Osaka is said to have been averted recently only with the assistance of outside plants and by using all available coal supplies in the area.

COMPLETE LIGHT-UNITS OF FLUORESCENT AT ITS FINEST

ready to modernize your plant now!

HYGRADE MIRALUMES Best, quickest, most economical way to modernize your lighting!



INSTALL—AND TURN ON DAYLIGHT!

THESE DIAGRAMS SHOW THE DIFFERENCE IN LIGHTING YOU GET!

53% COOLER for a given light output than old-type lighting.

225 SQ. INCHES LUMINOUS SURFACE

11 TIMES the luminous surface—several times more light-per-watt!

HYGRADE MIRALUME—HF-200—200-watt unit—complete with four 40-watt, 48" Hygrade Fluorescent lamps—approx. length, 50".

ALSO for industrial use: HYGRADE MIRALUME—HF-100—100-watt unit—complete with reflector and two 40-watt Hygrade Fluorescent lamps—approx. length, 57".

NEW THOUSANDS BEING INSTALLED EVERY WEEK!

High levels of illumination...without harsh glare or shadow...several times the light per watt...53% less heat for equal light! MIRALUMES—for every industrial or commercial use—are ready now. Corrected for power factor and stroboscopic effect (flicker)...starters easily accessible...completely engineered by HYGRADE. SEE your local Hygrade jobber... or mail coupon.



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Hygrade
Fluorescent
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MAIL COUPON TONIGHT!

Hygrade Sylvania Corp., Salem, Mass.
I am interested in Hygrade Fluorescent Miralume Units—HF-100, HF-200
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Automotive Buying Procedures Differ From Those of Other Industries

(CONTINUED FROM PAGE 48)

chases steel direct for fenders and sheet metal. Ford is in a class by itself; in some cases, Ford buys or provides materials for the minor manufacturing companies that are suppliers, just as it once provided the steel which Briggs formerly made into Ford bodies. Another distinction is that Ford is a steel producer.

Peculiar to the auto industry is the fact that each year its requirements change as car models change. For the introduction of the new models, each manufacturer must buy at least enough steel and parts to supply new cars for the shows, for dealers' floor models, for demonstrations, and to meet the initial demand from the public.

During the model year, "repeat buys" are made, until the end of the season, when accurate estimates must be made to conclude the model year without excess inventory.

Ford Program Differs from Others

Because Ford is a steel producer, the Ford program differs somewhat in practice from that employed by other auto makers, although basically the program is the same. Difference lies in the fact that the Ford steel mill is a prospective supplier on almost every item—and the Ford mill schedule is the center around which all Ford steel buying rotates. Not until this schedule is written out (virtually for three months ahead) does the Ford organization place any steel business with outside sources.

During recent weeks, while Ford was "preparing a buy," there came from almost every quarter, except the Ford offices, a variety of comments, news tips and miscellaneous information—all alleged to be "inside dope." Published widespread, these precipitated literally hordes of inquiries which indicated that automotive buying methods were poorly understood. Many of the interpretations of this "special" information were inaccurate and conclusions were unjustified.

One who was permitted to look deeply into Ford technique of "preparing a buy" would learn the amazing fact that there is very seldom available, even to Ford executives, the specific information which the tipsters report.

Until a Ford buying program is nearly at its ultimate point—actual buying—there usually is no information upon which to base statements regarding:

1. How much Ford will buy from outside sources.
 2. What items, specifically, will be purchased.
 3. What items, specifically, the Ford mill will produce.
 4. When delivery will be required (the Ford mill might be producing part of a requirement and its "delivery date" probably would prevail).
 5. There is no inquiry list from which specific data could be deduced.
- All general opinion to the contrary.



Attractive units, well suited for steel mills, oil refineries, grain elevators, pump houses and similar applications. Both main motor and overload relay contacts open and close under oil.

Arranged for wall mounting, the starter can be equipped, when desired, with self-contained, screw-type mechanism for lowering the oil tank.



HEAVY DUTY MOTOR CONTROL
FOR CRANES, MILL DRIVES AND
MACHINERY • BRAKES • LIMIT
STOPS • LIFTING MAGNETS AND
AUTOMATIC WELD TIMERS

there is never data regarding specific tonnages, items, types of steel or delivery date in the case of Ford's regular, almost quarterly, major purchases.

The reason for this is the fact that Ford operates its own steel plant and that Ford buys on the basis of a periodic "budget" which is peculiar to the Ford organization alone, and necessarily so.

One who studied the workings of this setup would note important differences from almost every other buying organization and would learn

many things that would make most of the recent newspaper stories and their reasoning seem entirely superficial. He would come to the conclusion that most of the "inside information" is nonexistent, even inside the Ford organization. This statement is true in more than merely a technical sense. Most of the specific data become available after the "buy" has been made—when allocations are made either to Ford's own mill or to an outside source.

This does not mean that NO infor-

mation is available. Actually, all the real basic facts are available and most of the "secrecy" is a myth.

A brief mental "trip" along the course taken by a Ford "buy" may be enlightening, even to some major suppliers.

The production of Fords, Mercurys, Lincoln-Zephyrs, trucks and tractors may be said to be started each year with the preparation of the "initial budget," a term with which most Ford suppliers are familiar. This budget is always more than ample to carry through the first three months of production unless a major spurt should upset calculations, in which case intermediate buying would be indicated. This first budget is followed in the normal course of events by quarterly budgets thereafter. ("Budget" indicates numbers of car units scheduled, not finances.)

In these respects, the Ford method is comparable to those used by other automobile companies. As in other cases, succeeding budgets become closer to actual production figures. And at the end of the model year, the clean-up buying is supposed to come out even with production.

The most recent budget at Ford was issued Jan. 25, and the budget, or equivalent, is available to every supplier who needs such information. From these figures it is already generally known that the accumulated total production of Fords and Mercurys, for example, is expected to be 650,000 units by May 1. ("Assembly Line," Feb. 8.) New purchases were authorized for 95,000 vehicles for consumption and use prior to May 1. This accounts for the 100,000-car figure so widely quoted when Ford started to buy steel a few weeks ago. Knowing that the Ford steel plant will normally produce about 60 per cent of the company's requirements, it is generally conceded that the "buy" in this case would be 30,000 to 40,000 tons. (This is on the usual basis of estimating one ton of steel per car.)

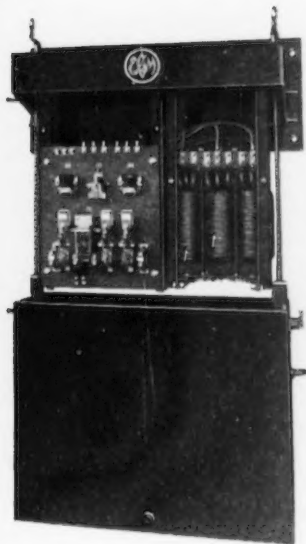
No "Inside" Information

At this stage (when the budget is released) it is more or less customary to ask for prices from all steel suppliers, and that was done in this case. It is worth emphasizing that there are no requisitions, no lists of types of steel or sizes or quantities. Yet it is from this starting point that the alleged "inside" information originates. And it is from such a start that the bogeyman of "price test" gets all the ammunition for what has been called "a war of nerves."

Normally, the process after prices have been submitted to Ford includes

WALL MOUNTED STARTERS FOR 110-550 VOLT MOTORS

BY
Electric Controller



Equipped with sight oil gauge and threaded conduit connections. All terminals located at top of starter-panel for convenient connection.

The illustrations above show—Full Voltage Starter (left)—two views of Reduced Voltage Primary Reactor Starter (right). Booklet No. 88 shows many other forms of EC&M Automatic Motor Control designed to meet a definite problem. Write for your copy to-day.

a "balancing" of the Ford mill capacity against the offerings of outside steel suppliers. To the Ford mill is allocated as much of the total requirements as seems practical; the remainder then awaits allocation to the bidders.

As this stage progressed (late last week and early this week) suppliers were able to learn whether their bids had been acceptable and whether they would get an order from Ford. However, even then exact tonnages were being determined (after the Ford mill

schedule was set), while those who had been successful bidders were still waiting to learn sizes, quantities and the exact types of steel on which they would get orders.

This was several days after some suppliers had been unduly excited by published reports which indicated that every detail had already been settled. The surprise element exists in the fact that some of the most sophisticated of the sellers became alarmed after the premature reports were spread.

What's New in Machine Tools?

(CONCLUDED FROM PAGE 44)

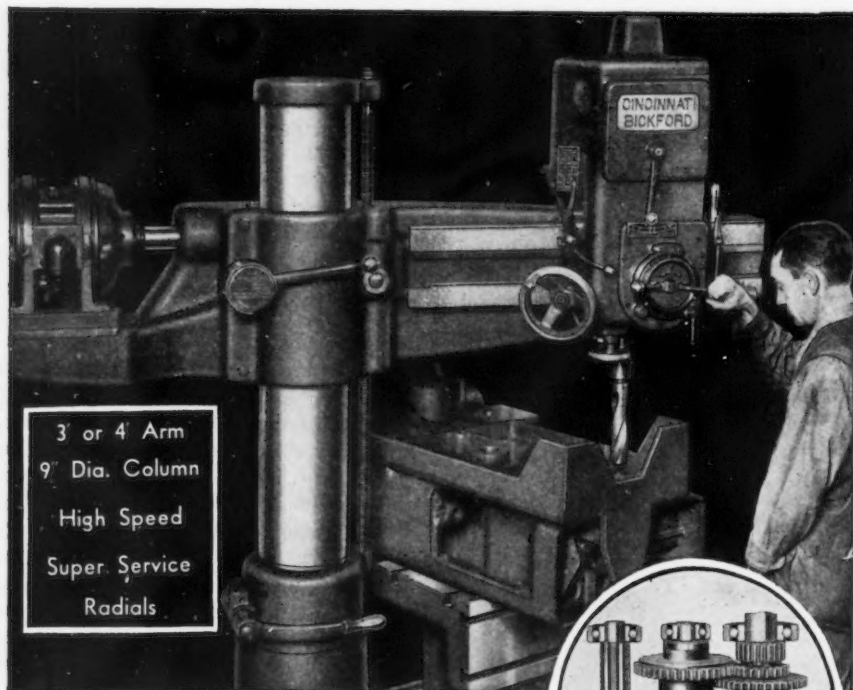
range for all classes of work. The machine can be equipped with a cross slide taper attachment, an open-type square turret, hand or power feed compound cross slide, independent lead screw attachment, thread chasing attachment, or other auxiliary equipment designed to meet particular production problems.

Universal Radial Saw

A NOVEL type of universal wood-working machine has been developed by the *American Saw Mill Machinery Co.*, Hackettstown, N. J., for use in woodworking shops and crating and boxing departments. This so-called Uni-Point radial saw is designed so that the saw pivots both horizontally and vertically about one point in the center of the table. Hence, on every cross cut, regardless of the angle, the saw enters the cut at the same point on the table, making possible faster and more accurate work. There is never any need to raise or lower the saw for any of the cross-cutting operations, and accurate fixed gage and cut-off stops can be used for any angle of cut. For these operations, the saw is traversed across the work through means of a square ram which slides back and forth on ladder type roller bearings. The knee supporting the saw and motor is mounted on this ram. The overarm supporting the ram telescopes in such a manner that when the saw is pushed back, there are no projecting parts to strike the operator's head or shoulders.

For ripping, the motor and saw is rotated 90 deg. on the knee and may also be tilted at any angle to the horizontal for bevel ripping. For this operation the work is traversed past the saw in the usual manner. When routing, shaping or tenoning, the motor arbor is made vertical. Angular variations for cross cutting are made by tilting the counterbalanced column supporting the cross arm.

All controls are centralized at the front of the machine, eliminating dangerous reaching over the machine. The Uni-Point saw is made in two standard sizes, the Junior carrying motors up to 2 hp. and saws up to 14 in., and the Senior carrying motors up to and including 7½ hp. and 18-in. saws. The corresponding capacities are cutting off up to 3 x 15 in. and 5 x 20 in., respectively, or ripping up to 28 and 40 in. wide. A carrying base with handles can be furnished for the Junior machine in place of the regular legs.



9 Spindle Speeds Only 11 Gears

Years of quiet, trouble-free, efficient operation are assured from this radial drill gear train. Nine spindle speeds are obtained with but eleven gears and at each speed there are only two gear contacts. This vital part of the Super Service Radial is noted for its compact simplicity.



Other construction features include—hardened chrome nickel steel gears, multiple splined shafts and anti-friction bearings which are automatically oiled and completely sealed against dirt.

Write for Bulletin R-21A.

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI OHIO U.S.A.

Book Lists New England Research Facilities

THE Engineering Societies of New England, Inc., has published a guide book listing all the research and engineering facilities available in New England. The book gives details on the facilities, experiences and industries served by over 300 private consultants, and lists all the colleges and universities in New England having laboratory and research equipment. Also included is an index of types of services rendered by which one may locate the consultant able to provide him with any one of 1300 different services. Educational and business background of key members of consulting organizations is also given.

Copies of this directory are available from Engineering Societies of New England, 715 Tremont Temple Building, Boston, at \$2 per copy.

Welded Connections for Tier Buildings

A REPORT on "Recommended Fundamental Principles, Tentative Minimum Requirements, and Tentative Standard Welded Connections for Tier Buildings," has been released by the American Institute of Steel Construction, 101 Park Avenue, New York.

The committee was appointed by the institute's board of directors in 1938. After a careful study it concludes that the subject is not yet sufficiently stabilized to justify issuing complete standard details at this time, but it has evolved certain tentative minimum requirements and recommended tentative typical details which are given in this report. The committee is proceeding with its work and from time to time will issue additional data. F. H. Frankland, chief engineer, of the institute is chairman of the committee.

Follansbee Orders Two Mills from United

UNITED ENGINEERING & FOUNDRY CO. has received orders from Follansbee Steel Corp. for two reversing cold mills, one temper pass mill and a tin plate flying shear, for delivery in July.

Follansbee Steel is a recent reorganization of Follansbee Brothers Co., with W. T. Brownscombe, formerly of McKeesport Tin Plate Co., as president. One of the objects of the reorganization was to permit modernizing of the plant at Follansbee, W. Va.

The company operates two plants, located at Follansbee, W. Va., and Toronto, Ohio, producing hot-rolled sheets and tin plate.

The Follansbee company plans to purchase hot-rolled, pickled strip and reduce it to tin plate gages on the two new reversing mills. After cleaning, it will be annealed in new, modern gas-fired annealers, temper passed and sheared. From this point on, it will be handled on existing equipment, which will be overhauled and additions made where required.

The temper pass mill is wider than

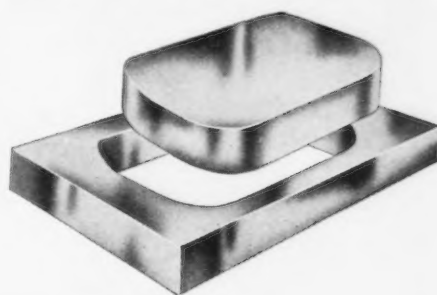
the reducing mills, so that it can take the product of an existing cold mill and any wider future mills. After rolling, the finished strip is coiled on a collapsing drum type coiler, from which the coil is removed to shearing lines, where it is side trimmed and cut to length.

The flying shear will be of a reciprocating type with a range of 18 in. to 40 in. This type of shear produces cut lengths of extreme accuracy over the entire range of lengths at any speed up to the maximum permitted by the reciprocating motion.

SAVED \$43 MAKING THIS PUNCH

Capitol Products Co. of Winsted, Conn., made this punch for base of electric toaster from 2" thick Paragon Tool Steel. The DoAll produced it in 2 hours and 20 minutes. Accuracy from outside to bottom, within .003". They estimate these savings:

17 hours, 40 minutes	\$28.00
25 pounds of steel	15.00



STARTLING RESULTS

Contour Sawing, the new DoAll process of machining, is recognized as the fastest precision method of removing metal; cuts out internal and external shapes from any metal up to 10" thick.



Does work of 3 machines. DoAll is a moderately priced, rugged, precision machine tool that replaces shaping, milling and lathe work on a large variety of jobs with enormous savings.

Used in large and small plants in 30 countries, by such firms as Cadillac, Fisher Body, Baldwin Locomotive, Federal Cartridge, New Monarch Machine, L. S. Hafkins, Edison Industries, Wayne Pump, U. S. Navy, etc.

DO-ALL
Contour Machine
BAND SAWING
BAND FILING
BAND POLISHING

Let a factory trained man bring a DoAll to your plant and show you what it does, what it saves on your own work.

FREE — New Handbook on Contour Machining — 158 pages of valuable metal working helps.

CONTINENTAL MACHINES, INC.
1311 S. Washington Ave., Minneapolis, Minn.

☐ Send data on the DoAll.
☐ Send Free Hand Book.

NAME

ADDRESS

THE IRON AGE, February 15, 1940—67

Republic Appeals Labor Case To the U. S. Supreme Court

CLEVELAND — Republic Steel Corp. has petitioned the Supreme Court of the United States to review the decision, rendered by the Circuit Court of Appeals for the Third Circuit last November, upholding the National Labor Relations Board's order requiring the company to reinstate with back pay striking employees not returned to work following the 1937

"Little Steel" strike. The petition presents to the Court eleven important questions, dealing chiefly with reinstatement of strikers and with strike violence, raised by the Labor Board's rulings in the case.

Republic's petition challenges the labor board's order on the ground that it was based upon the board's finding that the strike was caused by unfair labor practices by the company, whereas the "undisputed evidence disclosed that the sole cause of the strike

was the company's lawful refusal to sign a written collective bargaining contract presented to it by the SWOC as a step in the drive of the CIO to organize the nation's steel industry."

A.S.T.E. at Cleveland Elects C. V. Briner

CLEVELAND—At a meeting Feb. 9 attended by more than 220, the Cleveland chapter, American Society of Tool Engineers, elected C. V. Briner, Pratt & Whitney Co., as chairman. Mr. Briner, recently secretary, will be installed in April. He succeeds G. J. Hawkey, the Cleveland-Duplex Machinery Co., Inc.

Walter Wyatt, Wyatt Sales Co., was elected treasurer, and W. Reiff, Jr., Cleveland-Duplex Machinery Co., secretary.

An interesting technical lecture on Superfinishing was delivered by A. M. Swigert, Chrysler Corp., who showed samples of cluster gears, shafts and pins in ground and superfinished form. The surface analyzer recently developed by Brush Development Co. of Cleveland for recording the topography of finished surfaces, was demonstrated.

Nations Making Little Steel Use 12,000,000 Tons

COUNTRIES which must import all or most of their requirements of steel consumed almost 12 million tons of finished steel products in 1937, it is estimated by the American Iron and Steel Institute. World consumption that year was about 96,000,000 tons.

Almost 80 per cent of the steel consumed in countries where little or no steel is made was imported from England, France, Germany and Belgium-Luxemburg. Ten per cent came from the United States and the remainder came from other steel exporting nations.

Carrier Payroll up 200

INCREASE of its factory force by more than 200 since Jan. 1 is reported by the Carrier Corp. Jan. 8 marked the beginning of manufacture of new models and was the beginning of a back-to-work movement according to J. I. Lyle, president. The swing toward large scale installations that started last year was said still to be a favorable part of the air conditioning picture.

"HOWELL'S 1940 Model — the New Type K, Totally-Enclosed Fan-Cooled and STREAMLINED"




CUT Your COSTS With This Modern Motor — Dust and Fumes Can't Faze It!

Are you spending TOO MUCH on motor maintenance — metallic dusts or corrosive fumes "raising hob" with the motor windings? Do you have too many rewind jobs?

You can STOP most of this expense by switching to the HOWELL Type K—pictured above—built specially to cut drive costs in the metal working industries.

Here's a motor TOTALLY-ENCLOSED—dusts and fumes SEALED OUT—windings and every moving part kept free and clean of all destructive elements.

WRITE FOR BULLETIN K covering New HOWELL 1940 Model in this totally-enclosed, fan-cooled design. The first truly STREAMLINED motor—and just as far ahead in performance as it is in styling!

FOR GENERAL SERVICE IN CLEAN ATMOSPHERES



HOWELL Squirrel Cage (open type) Motors are built in a wide range of electrical and mechanical modifications, sizes 1/10 to 150 H.P.

FOR USE IN PROCESS WORK AND OUT-OF-DOORS



HOWELL Splash-Proof Motors offer complete protection where motor is subject to splashing or dripping liquids. All HOWELL Motors are precision built, precision tested.



HOWELL ELECTRIC MOTORS COMPANY

HOWELL, MICHIGAN

Representatives In All Principal Cities

Julius Kahn Heads New Fabricating Company

YOUNGSTOWN—Julius Kahn, former president of Truscon Steel Co., and a vice-president of Republic Steel Corp. until recently, is now chairman of United Steel Fabricators, Inc. The new company, using some of the space formerly occupied by United Engineering & Foundry Co., at Wooster, Ohio, will make corrugated drainage steel pipe, some steel building parts and other fabricated steel products. Walter F. Schulz is vice-president in charge of operations.

3,155,000 Have Jobs in Steel, Allied Industries

NEARLY 40 per cent of the total number of jobs provided by the nation's manufacturing industries are created by the manufacture and industrial use of iron and steel, the American Iron and Steel Institute has determined from a study of the 1937 census of manufactures. Of the total of 8,569,200 wage earners employed in manufacturing industries that year, more than 3,155,000 were employed in the steel industry and its principal manufacturing customers.

Westinghouse Employees Choose Independent Union

SHARON, PA.—Voting separately, hourly wage employees and salaried workers of the Westinghouse Electric & Mfg. Co.'s plant here last week chose the Sharon Westinghouse Employees' Association to represent them in collective bargaining.

Supervised by the NLRB, the election resulted as follows: of 3200 hourly wage employees, 1876 favored the Sharon Westinghouse Employees' Association with 742 opposed; of 467 salaried employees, 422 voted in favor of the association with 12 opposed. The ballot contained only the question whether the employees favored the employees' association. The CIO union was included on the ballot originally but permission was obtained by the CIO to withdraw.

Steel Earnings Increase

COLORADO FUEL & IRON CORP., Denver, reports for the six months ended Dec. 31, 1939, net in-

come of \$785,836, compared with a net loss of \$805,661 in the like period of 1938. Net income for the December quarter was \$554,553 compared with a loss of \$661,908 in the last three months of 1938.

Allegheny Ludlum Steel Corp., Pittsburgh, announced consolidated net earnings for 1939 of \$2,093,518, after depreciation, federal and state income taxes, but before dividend payments on preferred stock. Earnings for the fourth quarter of 1939 were \$1,411,423.

Wheeling Steel Corp., Wheeling, W. Va., reports net earnings for 1939 of \$5,560,755, compared with \$493,138 in 1938. The earnings for 1939 are equal to \$6.40 per share of common stock, compared with \$1.41 per share on the \$5 cumulative convertible prior preferred stock in 1938.

Net profit of Blaw-Knox Co., Pittsburgh, exclusive of unconsolidated subsidiaries, amounted to \$954,424 for 1939, compared with a loss of \$1,188 in 1938.

READY NOW...
*Useful Information on
Flexible Couplings*



If you are interested in the most efficient means of guarding against the effects of misalignment of connected shafts, you will find much helpful information in our new catalog of Farrel Gearflex Couplings.

This catalog, No. 443, explains the functions of a flexible coupling and describes how the wide range of types and sizes of Gearflex Couplings meets the requirements for practically any coupling application. Details of design, construction and application are described and fully illustrated by a series of 52 halftone plates and 21 diagrams. Tables of ratings, dimensions and weights covering seven types of flexible

couplings are given, and their applications listed.

The catalog also contains full information on service factors and their use, the application of service factors in selecting flexible couplings, information necessary in ordering, etc.

Complimentary copies of Farrel Gearflex Coupling Catalog No. 443 will be sent to plant executives and engineers who will write on their company letterhead to the address below.

FARREL-BIRMINGHAM COMPANY, Inc.
333 VULCAN STREET BUFFALO, N. Y.
FARREL SYKES GEARS *The Gear with a Backbone*

Canadian Orders for War Purposes Gain

TORONTO—With war contracts of a diversified nature appearing in greatly increased value, prospects for the Canadian iron and steel industry have brightened considerably during the past week or two. Canadian industrial leaders now look forward to a continuance of the present high operating schedules for the

steel industry and anticipating business on a much greater scale than can be handled with present facilities most companies are engaged in expansion programs. Announcement has just been made that Dominion Foundries & Steel, Ltd., Hamilton, Ont., will spend \$1,000,000 on additions to five of its plants, and it is understood that the enlarged plants will provide facilities for production of sheets and the manufacture of anti-aircraft gun barrels.

War orders placed during the week

totaled \$2,128,783. Of this total \$402,060 was for construction work.

Inquiries for steel and steel products are gaining in volume, largely due to new war business placed with the secondary industries and mills steadily are building up backlogs. Sheets and plates are the most active materials insofar as inquiries are concerned, while booking of these materials has been carried into the early part of third quarter with practically all Canadian production absorbed. Imports are increasing, chiefly from the United States.

Fans Designed and Built to Withstand High Temperatures



MICHIANA
High Temperature
FANS

MICHIANA Fans are unlike those of conventional design. Cast heat-resistant alloy steels are used — proof against distortion and unbalancing.

The wheel design eliminates the use of screws, bolts, rivets and welds, providing for free expansion and contraction both radially and axially. There is no restriction as to materials available only in plates since MICHIANA Fans are made of castings in our own alloy foundry,—the alloys selected to meet whatever heat or corrosive conditions are to be encountered.

MICHIANA Fans cost more—but quickly pay for themselves in longer life and lower maintenance. Now available in sizes from 900 to 64,000 cu. ft. . . . Details in Bulletin 638, let us mail you a copy.

MICHIANA PRODUCTS CORPORATION
Michigan City, Indiana

Canadian Company Gets \$25,000,000 Aircraft Order

OTTAWA—Contracts totaling upward of \$25,000,000 will be placed by the British War Office with Canadian Associated Aircraft Co., Ltd., Montreal. The order will be for bombers and is one of the largest yet placed with a Canadian company. Lt.-Col. J. H. M. Greenly, head of the British Supply Mission in Canada, is arranging final details of the order. The planes, it is stated, will be of the Short Sterling Bomber type, of 30 tons and equipped with four engines. This will be the first time craft of this type has been built here. The planes will be built and assembled in plants at Malton and near Montreal, Que. Canadian Associated Aircraft, Ltd., which was formed a couple of years ago, when it received its first British contract for Hampden bombers to the value of \$10,000,000, is controlled by six Canadian companies, including Canadian Car & Foundry Co., Montreal, Que., National Steel Car Corp., Hamilton, Ont., Fleet Aircraft, Ltd., Fort Erie, Ont., Ottawa Car & Aircraft Co., Ottawa, Ont.; De Havilland Aircraft, Ltd., and Fairchild Co. of Toronto. Several millions of dollars have been expended on plant improvements by the various companies and for the erection of assembly plants, one at Malton, Ont., and the other just outside Montreal, in Quebec. All facilities now are in order for production on a fairly large scale.

Canadian Imports From United States Increasing

OTTAWA—Imports into Canada in December last reached the high total of \$72,109,000 against \$44,286,000 in December, 1938. Most important gain was imports from the United States, which totaled \$49,103,000 against \$28,188,000 a year ago. Iron and steel and their products were

the most important items on the list and included, automobiles and parts, \$4,782,000, up from \$4,077,000; machinery, \$3,712,000, up from \$2,272,000; plates and sheets, \$2,917,000 against \$1,333,000; electrical apparatus, \$1,463,000 against \$991,000 and farm implements, \$1,447,000 compared with \$512,000 for the corresponding month of 1938.

British Steel Output At New High in 1939

LONDON (By Cable)—The United Kingdom's steel output in 1939 reached a fresh peak, the available figures indicating that production passed by a substantial margin the previous record of 12,984,000 tons in 1937. As publication of the British Iron and Steel Federation's statistics was discontinued upon the declaration of war, no details are available since those for July last. However, it is now possible to state that the average output during the last five months of 1939 at least exceeded 1,085,000 tons and was probably well over 1,100,000 tons.

Farm Implement Output In Canada Rose in 1938

OUTPUT of farm implements and farm machinery in Canada in 1938 was valued at \$21,299,185, a gain of 12 per cent over the 1937 total of \$18,961,394, according to the Dominion Bureau of Statistics. The 1938 value was the highest since 1930 and represented the fifth consecutive year in which an increase was shown since the low of \$5,326,416 was reached in 1932. The highest annual output, on a dollar volume, reported by the bureau was \$50,301,302 in 1920.

In 1938, 38 plants were active in the Canadian farm implement industry. Twenty-seven were located in Ontario, five in Quebec, four in Manitoba and one each in Alberta and Prince Edward Island. These plants employed an average of 6458 workers during the year and total wages paid were \$7,509,706. The plants in Ontario accounted for about 96 per cent of the year's output. Of the 38 plants covered by the report, 10 employed from 1 to 10 workers, six employed from 11 to 20, five employed from 21 to 50, eight employed from 51 to 100, three employed 101 to 200 and six employed over 200.

Imports of agricultural machinery in 1938 increased to \$20,319,626 from

\$17,233,658 in 1937, a gain of 18 per cent. The chief import item in 1938 was farm tractors and parts. The United States accounted for close to 94 per cent of the 1938 imports and Great Britain about 3 per cent. The United States was also the most important buyer of Canadian farm implements and machinery, taking about 35 per cent of the year's total exports of \$10,000,033. Argentina was the second best customer, taking 24 per cent, with British South Africa in third

place with 13 per cent and Great Britain fourth with 12 per cent.

Monsanto Spends \$4,200,000

MONSANTO CHEMICAL CO. invested approximately \$4,200,000 in 1939 for expansion and improvement of its manufacturing facilities at eight plants and anticipates an expenditure of a larger sum for such purposes in 1940.

NEED CONTROLLED POWER FOR TOUCHY JOBS?

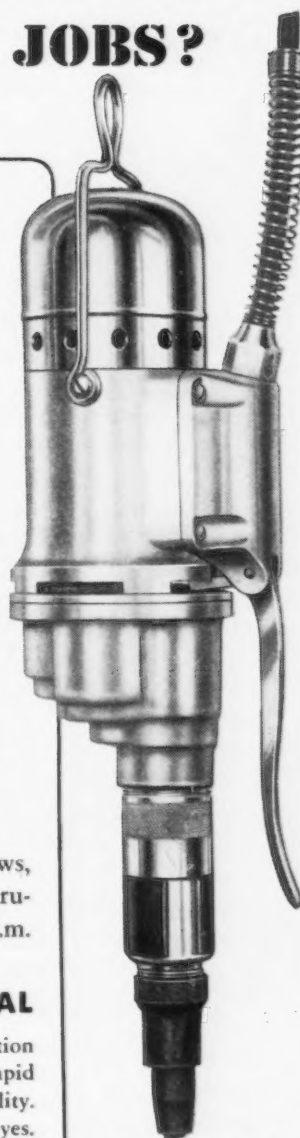
THIS NEW TOOL WAS MADE FOR YOU

Got trouble? . . . Want an extra fast, production screw driver with a velvety, adjustable automatic clutch that makes it no trick at all to set screws to just the right tension . . . with such cleverly designed switch control that even women operators can work it full time with minimum fatigue . . . with such versatility that it is equally efficient hung by the bail on a suspension spring, clamped in a bench stand with foot treadle, or fixed to a gooseneck stand?

That's the new Millers Falls No. 50 . . . and just a few of the benefits this great new unit brings. A production tool of the finest type, No. 50 is *compact* (weighs only 4¾ lbs.), *powerful* (drives up to No. 12 machine screws or No. 10 1½" wood screws, *built to stand up* (best quality materials thru-out). Speeds: 800, 1200, 2000 and 3000 r.p.m.

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There's almost no limit to the profitable production jobs this tool can do. One feature alone—the rapid reversing switch (optional) doubles its adaptability. A free trial on your own work will open your eyes. Let us arrange a date for you with your Millers Falls distributor. Write today.



Millers Falls Electric
Screw Driver No. 50

MILLERS FALLS COMPANY
GREENFIELD  **MASSACHUSETTS**

... THE NEWS IN BRIEF ...

Government interference with business overshadows technical topics at Conference of California Iron, Steel and Allied Industries.—Page 45.

Automobile assemblies drop to 95,985 in past week as February schedules are curtailed.—Page 46.

Automotive buying procedures differ from those of other industries.—Page 48.

John L. Lewis charges anti-labor collusion to "scuttle" the Wagner Act.—Page 50.

Potential bottleneck in production of airplane engines is well on way to elimination, Morgenthau says.—Page 52.

Number of persons engaged in industrial research rises fourfold since 1929 to 50,000.—Page 54.

U. S. Housing Authority approves more loans totaling \$16,857,000 for project in 12 communities.—Page 54.

Manganese ore stocks in the United States increased during 1939.—Page 54.

Bill curbing activities of New Deal bureaucracy still has chance to pass despite Administration opposition.—Page 56.

Government iron and steel purchases for week ended Jan. 20 total \$934,502.—Page 58.

War, Navy Departments, Bureau of Reclamation, announce awards of contracts.—Page 58.

War Department contracts for two-week period ended Jan. 31.—Page 60.

Iron Alloys Committee of Engineering Foundation completes 10-year research, issues 10 monographs.—Page 62.

Southern railroads ask rate cuts on steel.—Page 63.

Japan, faced by power shortage, reported buying coal from Canada and India.—Page 63.

Engineering Societies of New England, Inc., publishes guide to research and engineering facilities available in New England.—Page 67.

Follansbee Steel Corp. buys two mills from United Engineering & Foundry Co.—Page 67.

Welded connections for tier buildings.—Page 67.

Republic Steel Corp. asks United States Supreme Court to review decision of lower court, which ordered reinstatement of striking employees with back pay.—Page 68.

Carrier Corp. factory force is increased by 200.—Page 68.

American Society of Tool Engineers, Cleveland chapter, elects C. V. Briner, chairman.—Page 68.

Nations importing all or most of steel requirements consumed almost 12,000,000 tons in 1937.—Page 68.

Julius Kahn, former Truscon Steel Co. president, heads United Steel Fabricators, Inc., with plant at Wooster, Ohio.—Page 69.

Allegheny Ludlum, Wheeling Steel, Blaw-Knox and Colorado Fuel & Iron Corp. report increased earnings.—Page 69.

Forty per cent of jobs in manufacturing industries are created by steel producers and consumers.—Page 69.

Sharon, Pa., employees of Westinghouse Electric & Mfg. Co. choose independent union to represent them in collective bargaining.—Page 69.

Canadian orders for war materials show a gain. Iron and steel inquiries increasing.—Page 70.

Canadian imports of iron and steel from the United States increased in December.—Page 70.

Canadian Associated Aircraft Co., Montreal, receives \$25,000,000 aircraft order from British War Office.—Page 70.

British steel ingot output reached a new high in 1939, exceeding previous record in 1937.—Page 71.

Farm implement output in Canada increased 12 per cent in 1938.—Page 71.

House, factory building increased in January.—Page 75.

Fourteen Milwaukee workers found guilty of unfair labor practices by state board.—Page 81.

Government's form up to people, General Electric head says.—Page 81.

Illinois Manufacturers Association warns members of intermediaries in negotiating war orders with British, French.—Page 98.

Porcelain Enamel Institute publishes proceedings of fourth annual forum.—Page 98.

Herrick Iron Works constructs new warehouse in West.—Page 98.

Iron and steel imports declined for the third consecutive month. December total only 13,442 gross tons.—Page 102.

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MEETINGS

Feb. 15 and 16—Wisconsin Chapter, A.F.A., and department of mining and metallurgy, University of Wisconsin, regional conference, Milwaukee.

Feb. 29 and March 1—American Hot Dip Galvanizers Association annual meeting, Pittsburgh.

March 7 and 8—Grinding Wheel Manufacturers Association and Abrasive Grain Association, Southern Pines, N. C.

March 7 to 9—American Society of Tool Engineers, annual meeting, New York.

March 14 and 15—Society of Automotive Engineers, national aeronautic meeting, Washington.

April 10 to 12—International Acetylene Association, annual convention, Milwaukee.

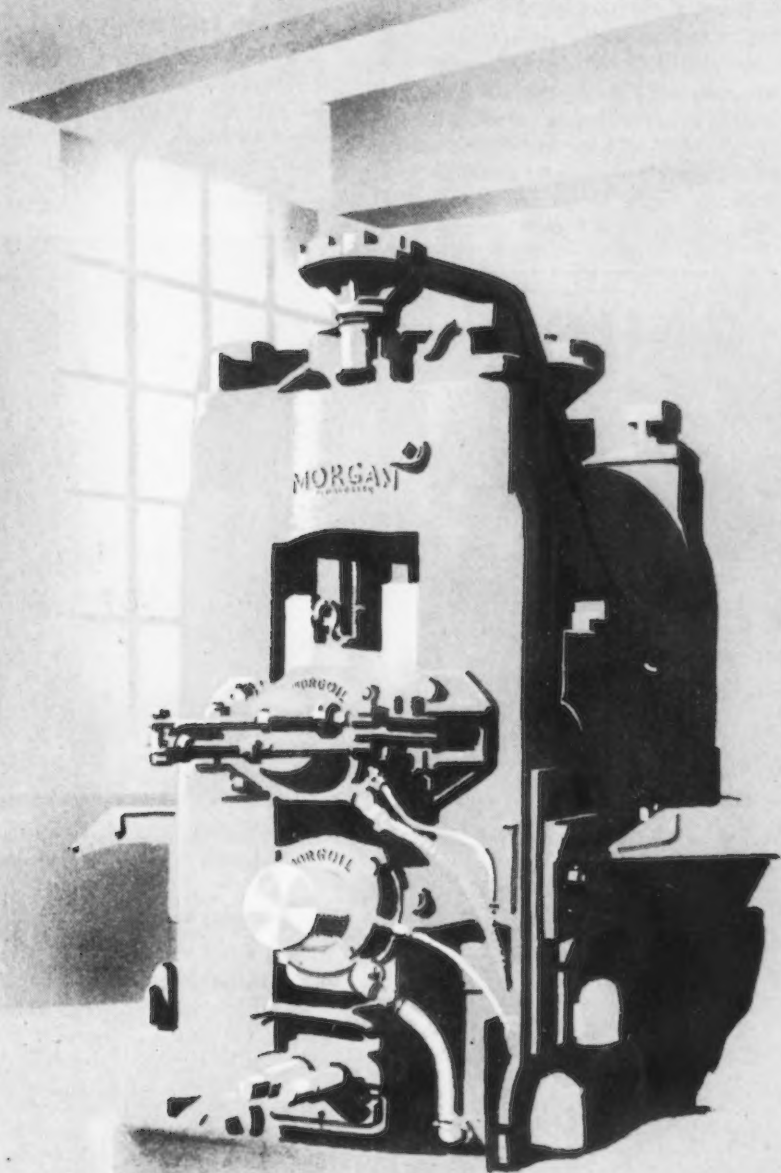
April 11 and 12—Galvanizers Committee of American Zinc Institute, annual spring meeting, Pittsburgh.

May 6 to 10—American Foundrymen's Association, annual meeting and equipment exhibition, Chicago.

May 20 to 22—American Gear Manufacturers Association, annual meeting, Asheville, N. C.

May 23—American Iron and Steel Institute, annual meeting, New York.

**MORGAN CONTINUOUS ROLLING MILLS REVOLUTIONIZE THE INDUSTRY
TODAY JUST AS THEY DID HALF A CENTURY AGO**



It is a tribute to the skill and thoroughness of Morgan engineers that many of the revolutionary new mills installed at the turn of the century are still giving faithful service. Designed to meet the growing demands of their day, they also anticipated the needs of the future.

Morgan Continuous Rolling Mills of today are built in the same fine tradition of thoroughness and provision for the future. *But there is also a difference!* For this modern equipment must handle far greater tonnage at higher speeds and with lower power consumption—maintain greater accuracy to assure uniformly high quality of product. Morgan planning and equipment afford a solid foundation for future profits.

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... OBITUARY ...

HARRY A. LORD, for the past 25 years Pittsburgh district sales manager for the American Rolling Mill Co., Middletown, Ohio, died of a heart attack in Orlando, Fla., on Feb. 6, aged 59 years. Early in this century he entered the steel business as a stenographer for the firm of Horner & Gough. Within a few years he was made a salesman and resigned to be-

come identified with the American Rolling Mill Co.



JOHN J. FASMER, until recently general sales manager of the Stephens-Adamson Mfg. Co., Aurora, Ill., died suddenly on Feb. 3, aged 56 years. He had been identified with the company since 1901, as superintendent of the main factory at Aurora until 1919, as manager of the St. Louis office to 1931 and as general sales manager at

Aurora until a few months ago when illness limited his activity and he took charge of special promotional projects.



D. B. JACOBS, vice-president, general manager and a founder of the Clifford-Jacobs Forging Co., Champaign, Ill., died at his home on Jan. 26, aged 61 years. As a young man he

LIGHTER GAUGE STAMPINGS, too



The versatility of our men and machines is limited only by the needs of those who entrust to us the important task of producing their stampings.

In the instance illustrated, a Tank Rim for an electrical transformer—16¾" long, 18⅞" wide and 5¼" deep—was stamped out of steel .075" thick. Yet each angle, arc, port and flange is clean and clear—and true to gauge.

Present your problems to Parish. The services of our engineers frequently result in economies of important proportions... yet their contributions are not evident in our costs.

Let us review your requirements.

PARISH PRESSED STEEL CO.
READING, PA.

PACIFIC COAST REPRESENTATIVE, F. Somers Peterson Co., 57 California St., San Francisco, Cal.



THE late Harry A. Lord, Pittsburgh district sales manager of American Rolling Mill Co.

entered the drop forging business and worked his way up from hammerman to general manager, serving a number of shops in the East and Middle West. In 1919 he helped organize the Clifford-Jacobs Forging Co.



EDWARD KIEFT, chief fuel and power engineer, at Gary works of Carnegie-Illinois Steel Corp. for more than 20 years, died last week aged 58 years. Mr. Kieft was a native of the Netherlands and obtained his technical education in Europe. His first business connection in this country was as an electrical engineer at the International Harvester Co. He became associated with the old Illinois Steel Co. in Gary in 1913, remaining with that organization until his death. Though Mr. Kieft was nominally in the fuel and power department, his knowledge of mathematics was applied in all branches of operations, particularly with reference to problems relating to fuel and power efficiency, rolling mill operations and maintenance of plant heat and power balances. He was a member of the

American Association for the Advancement of Science and of the American Association of Iron and Steel Engineers.

♦ ♦ ♦

OZRO E. UNDERWOOD, vice-president of the Robbins Engineering Co. and for 19 years employed by Hudson Motor Car Co., died Feb. 3 at Henry Ford Hospital in Detroit. Mr. Underwood, who was born at Norwich, Ont., in 1888, had lived in Detroit 25 years.

♦ ♦ ♦

TIMOTHY MEADOWS, president of Star Tool & Die Works for 21 years and secretary treasurer of Meado Products Co., died Feb. 2 at his home at Detroit. Mr. Meadows had long been identified with the automotive industry and was a member of the Automotive Tool and Die Manufacturers Association. Born in 1892 in Syston, Leicester, England, he had resided in this country since 1909.

♦ ♦ ♦

FRED W. ROGERS, 91, for many years president of the Stowell Co., Milwaukee manufacturer of castings, died at his home in Milwaukee following a long illness. He had served as president of the Milwaukee Association of Commerce in 1914-1915.

♦ ♦ ♦

WILLIAM LUBENOW, 79, founder and head of the Lubenow Mfg. Co., Milwaukee screw machine manufacturer, died Feb. 3 at his home in Milwaukee seven weeks after having suffered a cerebral hemorrhage.

♦ ♦ ♦

WILLIAM L. YULE, manager of the branch plant of Ford Motor Co., at Kansas City, was killed in an automobile collision on Jan. 31. He was 48 years old.

♦ ♦ ♦

ALBERT G. TURCK, 53, president, American Signal Corp., died at a Milwaukee hospital, Jan. 19, following a brief illness. He became interested in the company 20 years ago.

Steel Hats for Egypt

WASHINGTON—A contract for supplying steel hats to Egypt has just been awarded to a firm in India, says a report from the office of the American Commercial Attache, Cairo. In obtaining this order, which amounts to about £103,000, India competed with Australia. The contract was signed within 24 hr. of the receipt of the bid in Egypt.

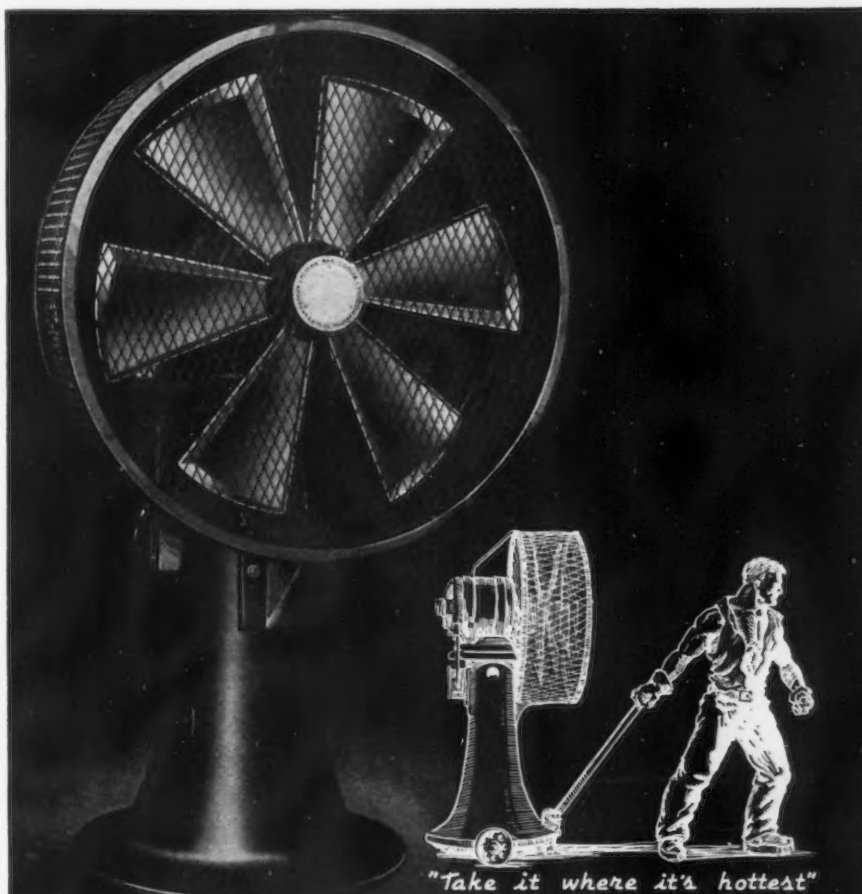
House, Factory Building Increased in January

ALTHOUGH the dollar volume of construction contracts awarded in January was below that of the comparable month of 1939, the number of contracts placed for dwelling units and manufacturing buildings showed a moderate increase, the F. W. Dodge Corp. reports. Total contracts placed in January in 37 Eastern states amounted to \$196,191,000 against \$251,673,000 in January, a year ago. Privately financed work in January

was valued at \$103,659,000, compared with \$103,757,000 in the like month of 1939, while publicly financed activity showed a loss of 37 per cent in the same periods.

Porcelain Booklets Ready

CHICAGO—Proceedings of the fourth annual forum of the Porcelain Enamel Institute have been published and are now available from the institute at 612 North Michigan Avenue, Chicago, at \$2 a copy.



Perkins Man Coolers create refreshing recirculation of air without chilling drafts.

Perkins Man Coolers help to maintain production schedules in the hottest places.

Perkins Man Coolers decrease labor turnover and help to make contented workers.

PERKINS MAN COOLERS ARE MADE IN OSCILLATING AND STATIONARY TYPES, BOTH PORTABLE.

B. F. PERKINS & SON, INC. HOLYOKE, MASS.

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TRADE MARK REG. U.S. PAT. OFF.

Outlook Still Dark for Healing Of Breach Between CIO and AFL

WASHINGTON—Efforts to negotiate a peace settlement between the AFL and the CIO were discussed in headlines last week but, despite statements from President Roosevelt, CIO Chairman John L. Lewis, and AFL President William Green,

prospects for healing the breach appeared to be no brighter.

Mr. Roosevelt revived interest in the subject by revealing at a press conference that a letter from Mr. Lewis, received sometime before Christmas, indicated that the CIO

head thought that no useful purpose would be served by resuming negotiations "at this time."

What the situation was last Friday, Mr. Roosevelt did not claim to know, but on Saturday the CIO generalissimo admitted in a speech that he had refused to resume peace negotiations. Mr. Lewis, who several weeks ago talked disparagingly about President Roosevelt's chances for reelection, appeared dubious that the CIO plan for a peace conference would be acceptable to the Administration.

Green Still Skeptical

The plan, a variation of a proposal previously made by Mr. Lewis, called for a March 15 conference in Washington to permit a vote on bringing all CIO units under the AFL. Once the convention ratified the proposal, Mr. Lewis would step out of the picture, and would not seek office in the reconstituted AFL, the CIO chieftain said last week.

"If he has serious proposals to make, let him agree to resume peace negotiations and submit his proposals to the AFL-CIO committee authorized to negotiate a settlement," said Mr. Green, expressing skepticism of the Lewis proposal. Intimating that the plan was an effort to cover up CIO tactics for blocking peace negotiations, other AFL officials also labeled the suggestion as "insincere."

"Clearly the statement is one of those tongue-in-cheek affairs in which Mr. Lewis delights," said John P. Frey, president of the AFL's Metal Trade Department. "The situation has now been somewhat clarified by the President, for the public had somehow got the inference that both the AFL and the CIO were equally guilty and equally responsible for failure to make peace in the labor movement."

U. S. Steel Publishes Book on Stainless Steel Fabrication

PITTSBURGH—U. S. Steel Corp. subsidiaries recently issued a bound book on "The Fabrication of U. S. S. Stainless Steels" which is divided into three sections. Part 1 is devoted to welding, riveting, soldering, and joint design; part 2 takes up machining, cutting, forming, annealing and pickling operations; and part 3 discusses surface finishing and protection. The book, obtainable from offices of the U. S. Steel Corp.'s major subsidiaries and priced at \$1 a copy, discusses in detail the technical and practical aspects of stainless steel fabrication.



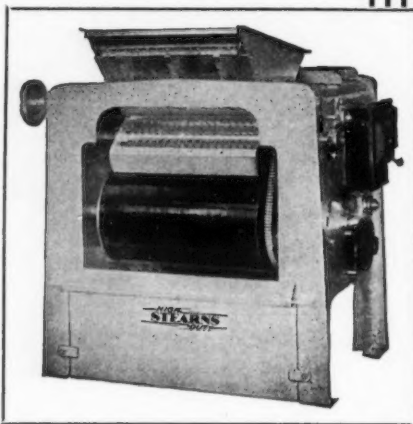
**BETTER VALUES
for
SCRAP METALS**

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**MAGNETIC
TYPE "L"
SEPARATORS**

Reclaim your brass and aluminum turnings and borings. Earn extra profits in scrap metals with this Stearns new and improved magnetic separator. A definitely profitable investment.

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635 So. 28th Street, Milwaukee, Wis.



Steel Employment Peaks Reached Since Continuous Mills Came In

SINCE 1926, when the first continuous rolling mill for producing wide strip-sheets was installed in the steel industry, new high records have been established for the number of workers employed in steel plants, according to the American Iron and Steel Institute. Annual steel production likewise reached new peaks during the period.

At the close of 1939 the steel industry was employing approximately 503,000 wage earners, 26 per cent more than were working in 1925, and 20 per cent more than in 1929. In 1925 the industry had not yet installed any continuous wide strip mills; by 1929 a total of seven were in operation, while 27 are in operation today.

The increase in steel output accompanying the rise in steel employment over the past 15 years brought the total output of steel in three of the past four years above the 1925 level, but not up to the records established in 1928 and 1929. However, for certain classes of products which are largely rolled on continuous mills, greater tonnages have been produced in the past three years than ever before in the steel industry's history.

Introduction of those continuous mills into the steel industry greatly increased the industry's capacity for producing the products which could be rolled on such mills. At the same time the quality of those products was improved, better products could be sold at the same or at lower prices, and new markets were opened up. The resultant increased demand is reflected in the greater number of workers employed since 1925.

More than half of the continuous mills in the steel industry today were built and put into operation within the past five years, when the industry was breaking all previous records for number of men employed. At the end of 1934, 12 such mills were in operation, while 15 more have been added since January, 1935.

TRADE NOTES

Tide Water Associated Oil Co. has set up a Southern branch for distribution of its products at 1122 South Boulevard, Charlotte, N. C. R. H. Mariner is the new regional manager, and W. H. Young, Jr., assistant.

Ransome Concrete Machinery Co., Dunellen, N. J., has appointed the Welding Engineering Sales Corp., 110 East 42nd Street, New York, as sales representative in New York State

and part of New Jersey. The Hawaiian Gas Products, Ltd., Honolulu, has been appointed exclusive representative for Hawaii.

Atlas Metal Stamping Co., Inc., designer and builder of precision tools, dies and special machinery, has moved its plant to 2080-90 Wheatshaf Lane, Philadelphia.

Magnetic Engineering & Mfg. Co., Clifton, N. J., has been organized to design and

build a complete line of magnetic separators, magnetic ore concentrators, magnetic chucks and clutches and special magnetic equipment. Officers of the company are: J. J. Ferris, president; J. L. Hope, vice-president, and F. E. Ferris, secretary and treasurer.

Portable electric grease guns made by Pressurelube, Inc., 22 East 40th Street, New York, are now being distributed by the Fruehauf Trailer Co., Detroit, Mich., for both industrial and transportation use. A particular feature of these portable lubricators is that the electric motor driving the high pressure pump is powered from a storage battery which is charged periodically by means of a tungar rectifier built into the equipment. In this way complete portability without reference to air or electric lines is obtained.



**AN EXTRA MAN'S WORK
FREE!**

LUBRICATION COSTS CUT . . . OUTPUT INCREASED!

Man power must be productive power in peak times—one large mill did this with SUN Heavy Duty Lubricants. Previously one man's labor was required to clean up waste oils . . . but with SUN LUBRICANTS this extra work was eliminated . . . the extra man was used in productive work.

But that's not all! With production at peak levels, they used 27% less lubricants and piled up a saving of more than \$1400.00 in the first six months of operation.

Just one record in one mill with SUN—one example of what SUN Heavy Duty LUBRICANTS could do in your plant. Let SUN aid you in improving your production at lower cost. Write . . .

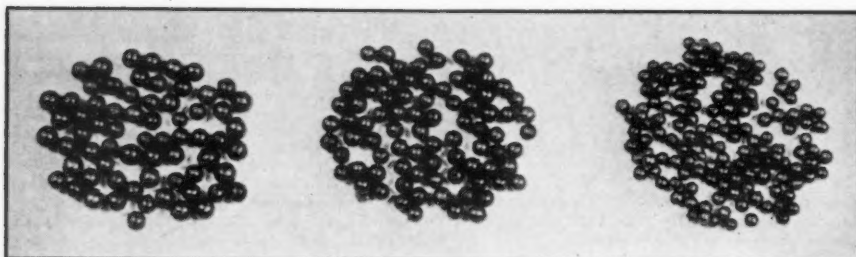
SUN OIL COMPANY
Philadelphia, Pa.

SUN HEAVY DUTY LUBRICANTS

SUN OILS

PETROLEUM PRODUCTS FOR ALL INDUSTRIES

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IN the period of one year we have built up a very large business with our Heat-Treated Steel Shot and Heat-Treated Steel Grit. This was accomplished on purely a quality product. Our many hundreds of customers, nationally known Concerns, are using our Shot and Grit, and sav-

ing money every day, blasting faster with less wear of abrasive. Our heat treating insures toughness and strength, fast blasting and long wear-

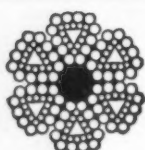
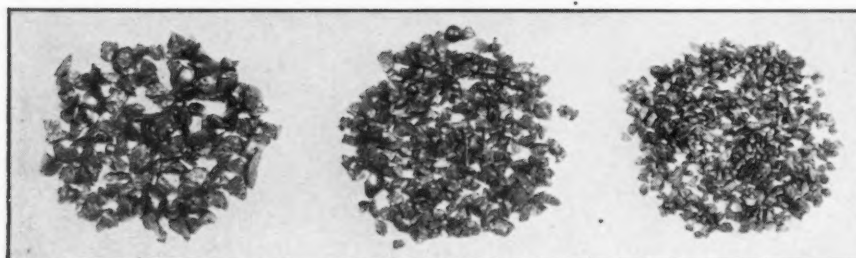
**We never
compromise
with quality.**

ing. Try it in your machine and prove the truthfulness of these statements.

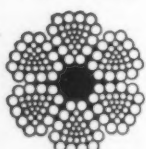
A ton or a carload.
Will match any size.

HARRISON ABRASIVE CORPORATION

MANCHESTER, NEW HAMPSHIRE



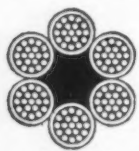
Style B
Flattened Strand



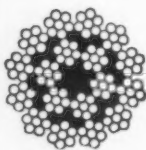
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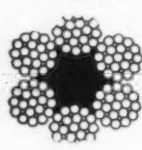
Wire Rope Center



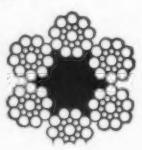
Steel Clad



18x7
Non-Rotating



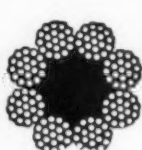
6x19
Filler Wire



6x19
Scale



6x37
Extra Flexible



8x19
Extra Flexible

You Can Depend On "HERCULES"* (Red-Strand) Wire Rope...

There is no guesswork when you use "HERCULES" (Red-Strand) Wire Rope. It is designed and built to do specific jobs better . . . safer . . . more economically. Furnished in a wide variety of constructions so as to be suitable for all purposes—each backed by 81 years of manufacturing experience and close co-operation with users.

—PREFORMED—

For maximum efficiency in Preformed Wire Rope, use Preformed "HERCULES". It is available in both Round Strand and Flattened Strand constructions.

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A. LESCHEN & SONS ROPE CO.

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. . . GREAT BRITAIN . . .

. . . Export quotations advanced
. . . Licenses are restricted

LONDON, Feb. 13 (By Cable)—British iron and steel output is still at a high level and is likely to remain so for some months as a greater percentage is going directly into government consumption. Shipbuilding demands are especially heavy and delivery dates on new orders for plates have been extended for some weeks.

Export quotations on heavy steel for approved destinations have advanced but are really nominal as export licenses are restricted.

Indications point to the fact that an export drive will be centered on completely finished high quality articles rather than on purely manufactured steel.

Sheet makers are open to accept limited orders for export with extended shipment, but permits are irregular.

Welsh tin plate makers are fully booked for several months as a result of a French government order, and only limited quantities for nearby shipment are available. Tin plate bar shortage is causing some apprehension. Efforts are being made to secure more equitable distribution of foreign imports.

Employees Hear Caterpillar Report Explained by Radio

THE 11,500 employees of Caterpillar Tractor Co., Peoria, Ill., not only were given copies of the company's annual financial report. It was explained to them over the air. On Feb. 5, B. C. Heacock, the company's president, used the Peoria radio station, WMBD, for one-half hour to interpret the Caterpillar report, the first such broadcast, the company believes, in industry's history.

"In spite of the fact that I used to be an auditor myself, I'll confess that balance sheets are not too easy to understand," said Mr. Heacock.

Monarch Machine Tool Co., Sidney, Ohio, showed a net profit for 1939, after all deductions including provision for Federal income taxes, of \$529,577, as compared with a net profit for 1938 of \$321,398, according to the company's annual report to shareholders. "Additions to plant and equipment made in 1939," Wendell E. Whipp, president, said, "have increased the company's productive capacity to such a point that at the present time shipments are at the rate of 66 2/3 per cent over the average monthly rate for the year 1939. The company has now a backlog of unfilled orders which bids fair to insure capacity production throughout the present year. Slightly over 50 per cent of unfilled orders are from customers in the United States."

NLRB Gives Joe Cook Of Chicago "Sundays Off"

WASHINGTON—The Valley Mould & Iron Corp., Chicago, has been directed by the National Labor Relations Board to disestablish the Valley Mould Independent Employees Union, South Chicago works, as a collective bargaining agency and to bargain exclusively with SWOC's Amalgamated Association of Iron, Steel and Tin Workers. The board also ordered the company to restore to Joe Cook, president of the Amalgamated local, his former privilege of having Sunday rather than Tuesday as a regular day off each week.

The board has announced that separate elections will be held among employees of the Central Foundry Co., Bessemer, Ala., one to determine whether production and maintenance employees want to be represented by either the Amalgamated or the AFL's International Molders Union, and the other to determine whether pattern makers wanted to be represented by Amalgamated or AFL's Pattern Makers Association or neither.

The board announced last Friday that a secret ballot election would be held within 30 days among employees of the Champion Blower & Forge Co., Lancaster, Pa.

CAST IRON PIPE

East Point, Ga., is considering extensions in pipe lines for water supply to College Park and Hapeville, including new pumping station and other waterworks installation. Officials of three places are formulating plans. J. R. Parham, mayor, East Point, is at head of project.

Portsmouth, Ohio, plans pipe line extensions in water system in western part of city. Cost close to \$100,000 including service facilities and other waterworks installation. C. S. Stevenson is city engineer.

Meridian, Miss., plans pipe line extensions in connection with new 5,500,000-gal. reservoir, to be located about one-half mile from city limits. Work is scheduled to begin soon. Cost close to \$75,000.

Alliance, Ohio, plans pipe line extensions in water system in different parts of city. Fund of about \$139,000 is being arranged for this and extensions in sanitary sewer system. V. J. Packer is public service director, in charge.

Omaha, Tex., plans pipe lines for water system and other waterworks installation, including elevated steel tank and tower. Cost about \$40,000. Freese & Nichols, Capps Building, Fort Worth, Tex., are consulting engineers.

Manhattan Beach, Cal., will begin work at once on pipe line extensions and replacements in district bounded by Rosecrans, Highland and Pacific Avenues, and Fifth Street. Cost about \$49,400. Financing has been arranged through Federal aid. J. R. Newville is city engineer.

Noxon, Mont., plans water pipe line system and other waterworks installation. Fund of \$14,693 has been secured through Federal aid and additional appropriation will be arranged through bond issue.

La Grange, Tex., plans pipe lines for water system and other waterworks installation. Fund of about \$260,000 is being arranged through Federal aid.

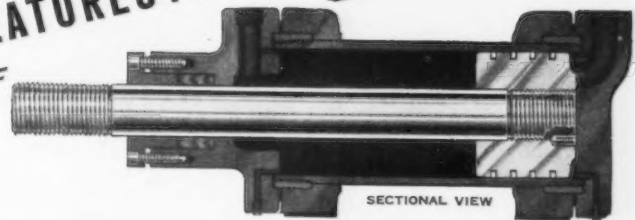
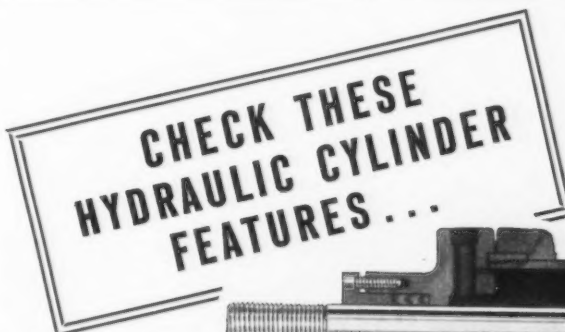


USE MOORE RAPID *Lectromelt* FURNACES for MELTING REFINING SMELTING

Illustration shows top charge type LECTROMELT furnace with roof raised and rotated to one side to permit quick charging with drop bottom bucket.

LECTROMELT furnaces offer the rapid and economic means for the production of plain carbon and alloy steel ingots and castings as well as gray and malleable irons. Top charge and door charge types are both available. LECTROMELT furnaces are built in standard capacities from 25 pounds to 100 tons. Write for details.

PITTSBURGH LECTROMELT FURNACE CORP.
Foot 32nd St. Pittsburgh, Pa.



• • The exclusive patented design of Hannifin hydraulic cylinders gives extra strength to withstand severe service, with simple construction and high efficiency operation that makes the most of hydraulic power. There are no tie rods, allowing removal of end caps without disturbing other parts. The special mirror finish honing produces a cylinder bore that is straight, round, and smooth. Perfect piston fit in a honed cylinder bore means no leakage, and minimum fluid slip. Write for Bulletin 35-A, giving complete information.

HANNIFIN MANUFACTURING COMPANY
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Engineers • Designers • Manufacturers
Pneumatic and Hydraulic Production Tool Equipment

HANNIFIN *hydraulic* **CYLINDERS**

PERSONALS

R. W. H. ATCHERSON has been appointed superintendent of the Gary works salvage department of Carnegie-Illinois Steel Corp.

Mr. Atcherson has been employed in the steel industry for 38 years. His first position was that of a burden clerk at the Bellaire works of the Carnegie Steel Co. in 1902. He served in a number of plant supervisory capacities with this company until 1918 when he entered the employ of the Inland Steel Co., at Indiana Harbor. Leaving this company in 1922 to become assistant superintendent of open hearth furnaces at Gary works, Mr. Atcherson successively served as assistant superintendent of blast furnaces and superintendent of blast furnaces. In 1929 he was given the post of special engineer and remained in this capacity until the present time.

♦ ♦ ♦

H. P. BINDER has been appointed assistant manager of the centrifugal pump division of the Allis-Chalmers Mfg. Co., Milwaukee. A graduate of the school of electrical engineering of Purdue University, Mr. Binder was selected to enter the Allis-Chalmers graduate training course in 1911. In 1912 he entered the hydraulic engineering department where he served until 1917, at which time he joined the 9th Field Artillery of the regular army. At the conclusion of the war he resigned with the rank of captain, and returned to Allis-Chalmers in 1919, taking up sales engineering work in the centrifugal pump division.

♦ ♦ ♦

OSCAR M. HAVEKOTTE, assistant treasurer of the Carnegie-Illinois Steel Corp., Pittsburgh, has been named president and general manager of International-Stacey Corp., Columbus, maker of derricks and other heavy equipment. He succeeds the late Lewis J. Brown. Mr. Havekotte has been identified with the Carnegie-Illinois Steel Corp. and its predecessor since his graduation from the University of Pittsburgh. He has been a director and a member of the executive committee of the International-Stacey Corp. for the past eight years.

♦ ♦ ♦

JOHN H. RASP has been appointed superintendent of the tool and die department of the sintered carbide division of Firth-Sterling Steel Co., McKeesport, Pa. He has had wide experience in the manufacture of specialty tools and dies.

J. H. CHIVERS has been appointed superintendent of melting, succeeding the late L. B. Knox. Mr. Chivers has served several of the leading tool steel companies in a metallurgical capacity, and just prior to his employment at Firth-Sterling was acting as consultant on melting practice to a number of steel companies.

♦ ♦ ♦

ALEX DOW, after 47 years as an executive of the Detroit Edison Co., has resigned the presidency of the utility concern, retaining, however, a connection as chairman of the executive committee of the board of directors. The presidency has been assumed by ALBERT C. MARSHALL, who has been vice-president and general manager. Mr. Dow, now nearly 72 years of age, took over the reigns of the utility when Henry Ford was in charge of one of the Edison power houses in Detroit. At the same time Mr. Ford was carrying out automotive experiments in his spare time. He encouraged the Ford experiments and has been one of Mr. Ford's closest friends. Mr. Dow's retirement as president will not affect his other duties, particularly those as head of the Detroit Ordnance District for the Army. He has been a prime mover in preparing industrial mobilization plans.

Mr. Marshall who succeeds him is 10 years younger than Mr. Dow but



R. W. H. ATCHERSON, new superintendent of salvage department, Gary works, Carnegie-Illinois Steel Corp.

has been with the utility since its organization as the Detroit Edison Co.

D. H. COREY, welding engineer at the Detroit Edison Co., addressed the Detroit section of the American Welding Society, Feb. 9, on "Welded Piping—Modes and Practices."

♦ ♦ ♦

WILLIAM H. MANNING has been promoted to assistant chief engineer in charge of design of the Pontiac Motor Division of General Motors Corp. Mr. Manning formerly was assistant chief in charge of experimental work. At the same time, GEORGE A. DELANEY, former electrical engineer, was named to head the Pontiac experimental laboratory. Mr. Delaney is chairman of the Detroit section of the Society of Automotive Engineers. L. RAYMOND SAMPSON, head of the technical data section, has been shifted to the electrical engineer post. WILLIAM J. DEBEAUBIEN, of the drafting department, has been appointed engineer in charge of accessories. GEORGE W. LAMPMAN, designer, has been placed on special assignment in charge of all rubber developments in connection with motor design. FORREST H. KANE, assistant to the chief engineer, has been elevated to executive engineer and will continue to specialize in cost analysis, budget and sales contact.

♦ ♦ ♦

J. M. COSGROVE, formerly chief chemist for the Noblitt-Sparks Industries, Inc., and before that process control engineer for the Meaker Co., has been appointed director of the development laboratory of the Standard Steel Spring Co., Coraopolis, Pa. He was graduated from Massachusetts Institute of Technology as an electrochemical engineer and also has a degree from Manhattan College.

♦ ♦ ♦

ROLAND McCUNE has been appointed district manager covering California, Nevada, Utah, Colorado, Arizona, New Mexico and Hawaii for the William Schollhorn Co., New Haven, Conn. JOHN B. MERIFIELD has been appointed to a similar post and will cover Oregon, Washington, Idaho, Montana, Wyoming, Alaska, British Columbia and Alberta.

♦ ♦ ♦

M. H. KUHLE, who has been identified since 1926 with the sales department of the industrial division of the Timken Roller Bearing Co., Canton, Ohio, has been made assistant manager of that division, succeeding S. D. PARTRIDGE, who was made manager of the industrial division a few weeks ago. Mr. Kuhl was graduated from the University of Illinois in 1926.

P. J. REEVES, heretofore manager of the Los Angeles office of the Timken company, has been transferred to the home office to engage in special sales work. He is being succeeded at Los Angeles by S. T. SALVAGE, who has been with the sales-engineering staff of the company for the past seven years.

♦ ♦ ♦

JOHN E. HARRIS has been named superintendent of the International Harvester Co. Milwaukee works, to succeed E. J. LEISER, who has retired after 35 years of service. Mr. Harris takes over on Feb. 15. He is assistant superintendent of the company's Chicago tractor works and has had 12 years of service with the company. He formerly was in the automotive and electric refrigerator industry. He first came with International Harvester in its Farmall works at Rock Island, Ill., where he rose successively to tool room foreman, foreman of the motor department and night general foreman. Five years ago he was transferred to the position he held before his present promotion.

♦ ♦ ♦

KEITH T. DAVIS, with the L. J. Mueller Furnace Co., Milwaukee, since 1937, has been named chief engineer of the company. Since joining the firm as assistant engineer, Mr. Davis has been active in development of heating and air conditioning equipment. Previously he had been associated in the electrical department of the Lincoln (Neb.) property of the United Light & Power Co.

EMIL COESFELD, formerly in charge of the lithographing department of the National Enameling & Stamping Co., Milwaukee, has organized the Metal Art Lithographing Corp., with a factory at 1918 W. Lloyd St., that city, to produce metal signs, name plates and similar products.

♦ ♦ ♦

HORACE S. BUMBY, director, treasurer and vice-president of the Barlow & Seelig Mfg. Co., Ripon, Wis., has been named president, and W. A. ROYCE, New York, treasurer, to succeed the late R. C. Hammer. Mr. Bumby has been associated with the company since 1927 and with other Ripon industries for many years. R. C. LABISKY, who has been with Barlow & Seelig for 17 years, has been appointed assistant to Mr. Bumby. R. I. PETRIE, former president and general manager of the firm, had been in that position since Jan. 1, 1939. He was a Kelvinator official before joining Barlow & Seelig. His plans are indefinite.

♦ ♦ ♦

E. A. KING, manager of the Chester, Pa., plant of Wackman Welded Ware Co., St. Louis, Mo., has been appointed executive vice-president of the company. L. F. MCKAY, manager of the company's North Kansas City, Mo., plant, and C. L. FLORI, manager of the New Orleans plant, have also been elected executive vice-presidents.

♦ ♦ ♦

WILLIAM JACKSON, formerly porcelain enamel consultant for Republic

Steel Corp., has been made district sales representative in the Detroit territory for the Porcelain Enamel & Mfg. Co., Baltimore.

Government's Form Up to People, G-E Head Says

PITTSBURGH—The capitalistic system can only function in a democratic form of government, and freedom of expression, as well as private enterprise, is impossible in totalitarian states, Philip D. Reed, new board chairman of General Electric Co. told 1400 engineers and executives at the annual Engineers Society of Western Pennsylvania banquet held recently at the William Penn Hotel.

"Democracy definitely excludes despotic rule," Mr. Reed said. "Its concept contains no inherent guarantee of the private enterprise system and no inhibitions against Government activity in business, agriculture, and other fields. What form of government we may have at any given time depends entirely on what the people decide," he said.

Mr. Reed told the engineers that the solution toward a better relationship between business and the public could only be found in a complete explanation to the people concerning American business and the carrying out of an industrial policy which will continuously lead to better quality products at lower prices. Only by such a policy, he indicated, could any headway be made in helping to solve unemployment.

Other speakers included F. J. Chesterman, vice-president, Bell Telephone Co. of Pa., new president of the association, and Congressman Charles A. Eaton, New Jersey. Avery C. Adams, vice-president, sales, U. S. Steel Corp. of Delaware, was toastmaster.

14 Milwaukee Workers Lose "Employee Status"

MILWAUKEE—Fourteen employees of the Allen-Bradley Co. have been found guilty of unfair labor practices and declared to have "lost their status as employees" by the Wisconsin employment relations board in the first decision of its kind to be handed down. The order is the result of controversy between the company and officials of the CIO union which called a strike last summer.



SHOWN here are three of 244 employees of American Steel & Wire Co., Cleveland, plants honored recently for long service. Left to right they are Lawrence Golembiewski and William Moseler, each with 45 years' service, and John Bampton, with 50 years' service.

Scrap Licensing Law Won't Involve Foreign Policy, House Group Told

WASHINGTON — Testimony that no question of foreign policy would be involved if Congress should see fit to authorize the licensing of scrap iron and steel exports in the interest of national defense was presented to the House Military Affairs Committee on Tuesday by an official of the State Department.

Dr. Herbert Feis, adviser to Secretary of State Hull on economic affairs, told the committee that "if Congress should deem such legislation advisable for national defense, no question of foreign policy would be presented." The witness, who appeared at public hearings on a bill by Representative J. Joseph Smith, Democrat, of Connecticut, to empower the President to license the exportation of scrap in the interest of national defense, added the proviso that any licensing restriction should be drafted so as to treat all individual nations alike. A bill similar to the Smith measure has been introduced in the Senate by Senator Francis T. Maloney, Democrat, also of Connecticut.

Indorsed by Wolcott

The measure, patterned after the tin plate scrap licensing law passed in 1936, was indorsed by Robert W. Wolcott, president, Lukens Steel Co., Coatesville, Pa., and chairman of the Independent Iron and Steel Producers Committee on Scrap, and by Prof. Bradley Stoughton, dean of the college of engineering, Lehigh University, Bethlehem, Pa.

Mr. Wolcott testified that his committee was seeking passage of the bill as a step toward "reasonable conservation" rather than to "depress the price" of scrap. He said that, whereas a recent survey by the Bureau of Mines showed approximately 7,200,000 tons on hand in November, actually the scrap available to plants in the East was limited to a six or seven weeks' supply.

Citing figures showing that over 3,500,000 tons of scrap were exported during the first 11 months of 1939, half of which he said represented shipments to Japan, Mr. Wolcott compared this figure to 1932 when he said only about 250,000 tons represented the average annual exports of scrap.

Unable To Get Needed Scrap

He asked the committee to enact legislation to enable the small non-

integrated steel mills to have access to an adequate supply to satisfy both national defense and ordinary needs. It was his testimony that his company is "unable to get the type of scrap we need for satisfactory operation."

Dr. Stoughton submitted to the committee figures in substantiation of his argument that the use of scrap by domestic steel producers helps to conserve iron ore resources. The line of questioning indicated that, of those members present, the committee is about equally divided on the question.

Similar License On Steel?

Edwin C. Barringer, executive secretary, the Scrap Iron and Steel Institute, testified that to be consistent the bill should also provide for the licensing of pig iron and finished steel exports.

The bill seeks to hang an embargo plan on the peg of national defense, and would, according to Mr. Barringer, tend toward monopoly in the steel industry, disturbing the position of the scrap industry as the only large supplier of the steel industry which is not "captive."

Asked by one committee member if the real effort back of the bill is to lower scrap prices, Mr. Barringer observed that "we don't hear much about the legislation until scrap prices go up above \$17 a ton." Answering the question of whether there is a scrap shortage, the witness pointed out that during the final quarter of 1939, steel production was at the rate of 64,000,000 tons a year. Yet starting in October, he said, the price of scrap dropped during that entire three-month period, indicating to him that the mills have an adequate supply of scrap.

70 Per Cent Unacceptable

Mr. Barringer informed the committee that 70 per cent of all scrap exported is unacceptable to most domestic mills and that from 1925 to 1938 there was added to the potential reservoir of scrap some 400,000,000 tons, while only 14,000,000 tons were withdrawn for export.

The War Department was represented by Col. Harry T. Rutherford, director of its planning branch, as considering an embargo unnecessary in the interest of national defense. Tin and rubber are more important than scrap from a strategic and critical material standpoint, he said.

Other witnesses appearing on behalf

of the Smith Bill, and who expressed fear of a scrap shortage, included F. E. Vigor, transportation manager, American Rolling Mill Co., Middletown, Ohio; L. L. Middleton, vice-president, Sheffield Steel Corp., Kansas City, Mo.; H. E. Pape, purchasing agent, Stanley Works, Bridgeport, Conn., and Roger L. Wensley, executive secretary, Independent Steel and Iron Producers Committee on Scrap.

Robert H. Ridgway, speaking for the Bureau of Mines, testified that the Interior Department several years ago expressed the view that the restriction of scrap exports was both unnecessary and undesirable. The basic situation remains unchanged, he told the committee. He said that the Bureau of Mines' latest report on scrap supplies, covering stocks on hand as of December, 1939, would be available sometime between March 15 and March 30.

REINFORCING STEEL

... Awards of 11,225 tons; 11,550 tons in new projects

ATLANTIC STATES AWARDS

1365 Tons, Brooklyn, Quartermaster Supply Invitation QMSO-626-40-227, to Bethlehem Steel Co., Bethlehem, Pa.
1260 Tons, New York, Invitation 321949, Procurement Division, Treasury Department, to Truscon Steel Co., Youngstown.

CENTRAL STATES

7500 Tons, Chicago, west substructure, South side filtration plant, to Joseph T. Ryerson & Son, Inc., Chicago.
1100 Tons, St. Louis, city hospital, to Laclede Steel Co., St. Louis.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

1300 Tons, Washington, Army Department building, John McShain Co., Philadelphia, low bidder.
840 Tons, Toby Creek, Pa., dam for Army Department; bids in.
600 Tons, Springfield, Mass., Mill River pressure tunnel; bids March 1.
300 Tons, Cecil County, Md., Elk River bridges; bids taken Feb. 13.
240 Tons, Washington, superstructure, Navy Yard building, No. 200.
145 Tons, Hackensack, N. J., highway project PAS-7C.

CENTRAL STATES

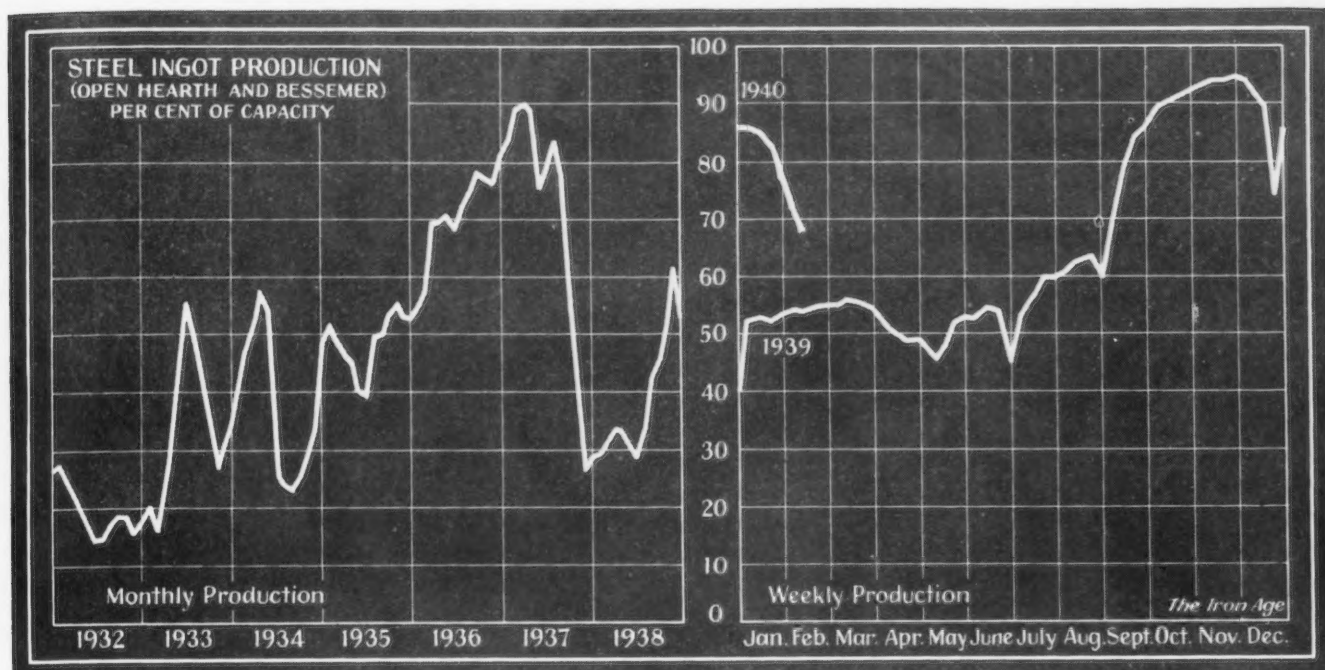
500 Tons, Nimrod, Ark., dam, Perry and Yell Counties; bids Feb. 27.
250 Tons, Chicago, subway section, Robt. R. Anderson Co., Chicago, low bidder.
190 Tons, Chicago, Schwill Elevator Co., addition; bids in.
137 Tons, Columbus, Ohio, factory for Columbus Coated Fabrics Co. Leo E. Ruisinger, general contractor.
100 Tons, Chicago, Bunte Candy Co. warehouse; bids in.
Unstated tonnage, Peoria, Ill., two E-type wards, State hospital; bids in.
Unstated tonnage, Gary, Ind., housing projects; bids in.
Unstated tonnage, Rantoul, Ill., administration and headquarters buildings, Chanute Field, bids Feb. 15.

WESTERN STATES

1300 Tons, Odair, Wash., for Grand Coulee Dam, bids by Bureau of Reclamation Feb. 19.
1050 Tons, Odair, Wash., for Grand Coulee Dam, bids by Bureau of Reclamation Feb. 20.
430 Tons, Eugene, Ore., Fern Ridge Dam; bids March 5.
157 Tons, Acequia, Idaho, Bureau of Reclamation (Invitation A-5800-A); bids in.

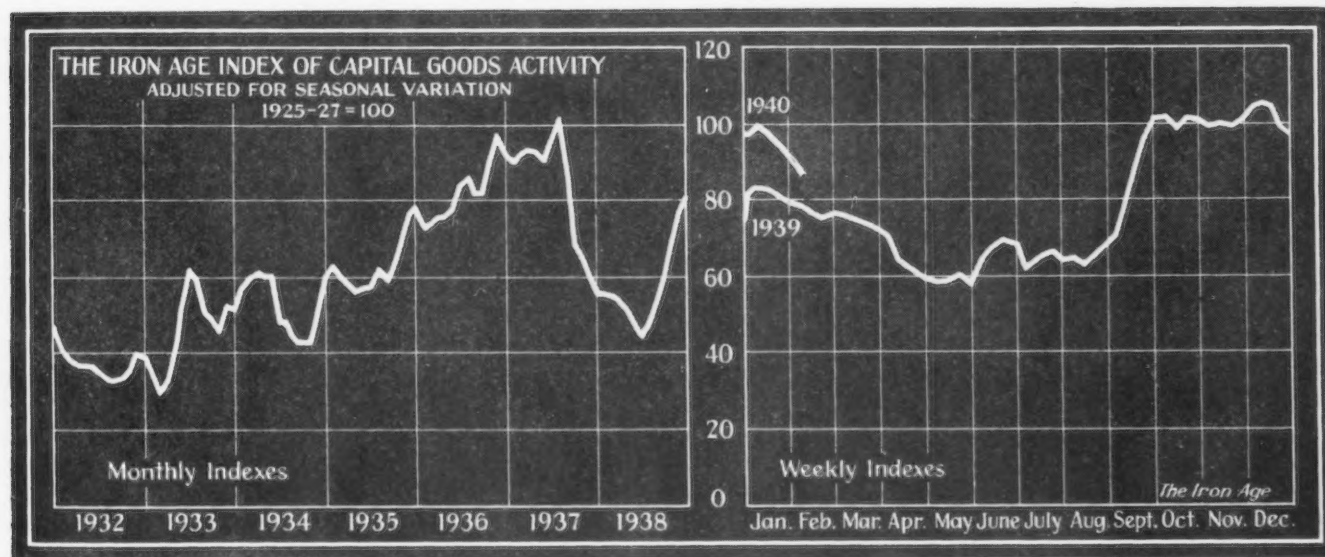
PANAMA CANAL ZONE

4000 Tons, officers' quarters; bids Feb. 28.



		Pitts- burgh	Chicago	Valleys	Phila- delphia	Cleve- land	Buffalo	Wheel- ing	Detroit	Southern	S. Ohio River	Western	St. Louis	East- ern	Aggre- gate
District Ingot Production, Per Cent of Capacity	CURRENT WEEK..	66.0	69.0	46.0	76.0	66.0	72.0	80.0	92.0	88.0	61.5	80.0	64.0	70.0	68.5
	PREVIOUS WEEK..	69.0	75.0	49.0	81.0	69.0	61.5	80.0	96.0	88.0	61.5	87.5	71.0	90.0	71.5

Mixed Trends Prevail in Capital Goods Index



THE IRON AGE capital goods index declined again in the past week, making the fourth consecutive weekly decrease from the year's high of 100 in the second week of January. The combined index for the past week stands at 86.6, as compared with 89.5 in the preceding week and 78.6 in the comparable week of 1939. Three of the index's components, steel, automobiles and Pittsburgh, were lower in the week, while the lumber and heavy construction factors registered small gains. These latter two components, significantly, reflect activity in various phases of the construction industry. The loss in automobile assemblies was about in line with expectations, while the drop in the Pittsburgh factor was due largely to the reduction in river shipments caused by the frozen conditions of rivers in that area. Despite the steady decline of the com-

bined index over the past month, all individual indexes except heavy construction, are above their respective positions at this time, a year ago.

	Week Ended Feb. 10	Week Ended Feb. 3	Comparable Week	
			1939	1929
Steel ingot production ¹	96.0	104.2	78.1	116.6
Automobile production ²	101.8	107.9	89.6	137.4
Construction contracts ³	71.0	69.8	105.6	130.6
Forest products carloadings ⁴	61.7	56.6	50.2	113.9
Production and shipments, Pittsburgh District ⁵	102.3	109.0	69.7	118.8
Combined index	86.6	89.5	78.6	123.5

Sources: ¹THE IRON AGE; ²Ward's Automotive Reports; ³Engineering News-Record; ⁴Association of American Railroads; ⁵University of Pittsburgh. The indexes of forest products carloadings and activity in the Pittsburgh area reflect conditions as of the week ending Feb. 3. Other indexes cover the week of Feb. 10.

... SUMMARY OF THE WEEK ...

... *Steel production continues to decline as new business lags.*

° ° °

... *Export demand one of the most encouraging factors at present.*

° ° °

... *Automotive purchase of sheets establishes firmness of prices.*

THE downward trend of steel production has not been halted nor has new business developed in sufficient volume to prevent a further decline. This week's rate of ingot output is estimated at 68½ per cent, down three points from a week ago. The current rate is supported to a moderate extent by the replenishment of inventories at some mills. Lower ingot production is accompanied by the banking or blowing out of several steel company blast furnaces, particularly in the Pittsburgh, Chicago and Youngstown districts.

At approximately what point production may be brought into balance with consumption is not yet clearly indicated, since many consumers continue to draw upon their own stocks of steel. While it is believed that steel consumption has not dropped as sharply as steel production, the question will not be fully answered until consumers' inventories are worked down to a lower level.

A survey of consumers' stocks made by a large steel company showed that a fairly healthy condition prevailed in mid-January, with stocks not so inflated as they were in the last half of 1937.

In addition to the inventory situation, the failure of new buying to revive in advance of the period of spring activity is generally ascribed to prolonged cold weather and heavy snows throughout the country, the ability of mills to make prompt deliveries of many products, and to uncertainty regarding the price situation. The placing of a tonnage of sheets by the Ford Motor Co. at full published quotations may serve to reestablish confidence among buyers in the stability of the current price level. Other users of sheets have been unsuccessful in their efforts to obtain lower prices on sheets other than the \$2 a ton concession granted by hand mills on hot rolled pickled sheets in

gages 19 to 22 inclusive to meet the identical price quoted on mill run cold rolled sheets.

Pig iron prices also withstood a test on an inquiry for 1000 tons of basic on which an Eastern buyer failed to obtain a quotation below the market.

Export prices, although lower than they were some months ago, have also resisted efforts for further concessions. Some products are being quoted at domestic price levels and some as much as \$3 a ton above domestic prices. The fact that British export prices on plates, shapes and bars have been advanced about £1 a ton and that export licenses there are becoming more difficult to obtain will tend to support American export prices.

Demand for steel from abroad has been gradually expanding. This is one of the most encouraging factors in the present situation. Greater activity is expected in the spring, especially if the threatened total war should develop. Canadian shipyards, which have received orders for anti-submarine boats, have placed orders in the United States for several thousand tons of plates. An increasing volume of steel orders from the Dominion is expected because of expanding war activities there.

AUTOMOBILE assemblies are declining as manufacturers await the spring demand. Inventories of completed cars are estimated at about 400,000. Additional purchases of steel will be necessary soon for spring manufacturing schedules.

Shipbuilding is one of the activities that will not be permitted to lag. The Maritime Commission has announced that six tankers, with provisions for use in national defense, will be built for the Socony-Vacuum Oil Co. These will require 31,000 tons of steel. About 24,000 tons will be needed for trans-Pacific liners, on which the commission will receive bids by May 7.

Fabricated structural steel business is light in general, but the week's awards of about 21,700 tons include 17,600 tons for the Pit River Bridge in California, awarded to the American Bridge Co. Reinforcing bar awards are in fairly good volume at 11,225 tons.

SCRAP prices continue to drift downward, revisions this week reducing THE IRON AGE scrap composite price 8c. to \$17. Hearings on a bill to license iron and steel scrap exports in the manner in which tin plate scrap exports are controlled were begun in Washington on Tuesday.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

Per Gross Ton:	Feb. 13, 1940	Feb. 6, 1940	Jan. 16, 1940	Feb. 14, 1939
Rails, heavy, at mill	\$40.00	\$40.00	\$40.00	\$40.00
Light rails: Pittsburgh, Chi- cago, Birmingham	40.00	40.00	40.00	40.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Bir- mingham, Sparrows Point	34.00	34.00	34.00	34.00
Sheet bars: Pittsburgh, Chi- cago, Cleveland, Youngs- town, Buffalo, Canton, Sparrows Point	34.00	34.00	34.00	34.00
Slabs: Pittsburgh, Chicago, Gary, Cleveland, Youngs- town, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	34.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Bir- mingham	40.00	40.00	40.00	40.00
Wire rods: Nos. 5 to 9/32 in., Pittsburgh, Chicago, Cleve- land, cents per lb.	2.00	2.00	2.00	1.92
Skelp, grvd. steel: Pitts- burgh, Chicago, Youngs- town, Coatesville, Sparrows Point, cents per lb.	1.90	1.90	1.90	1.90

Finished Steel

Cents Per Lb.:	Feb. 13, 1940	Feb. 6, 1940	Jan. 16, 1940	Feb. 14, 1939
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.15	2.15	2.15	2.25
Plates: Pittsburgh, Chicago, Gary, Birmingham, Spar- rows Point, Cleveland, Youngstown, Coatesville, Claymont	2.10	2.10	2.10	2.10
Structural shapes: Pitts- burgh, Chicago, Gary, Buf- falo, Bethlehem, Birming- ham	2.10	2.10	2.10	2.10
Alloy bars: Pittsburgh, Buf- falo, Bethlehem, Massillon or Canton	2.70	2.70	2.70	2.80
Cold finished bars: Pitts- burgh, Buffalo, Cleveland, Chicago, Gary	2.65	2.65	2.65	2.70
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham	2.10	2.10	2.10	2.15
Cold rolled strip: Pittsburgh, Cleveland, Youngstown ...	2.80	2.80	2.80	2.95
Sheets, galv., No. 24: Pitts- burgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham ...	3.50	3.50	3.50	3.50
Hot rolled sheets: Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown ...	2.10	2.10	2.10	2.15
Cold rolled sheets: Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown ...	3.05	3.05	3.05	3.20

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Cents Per Lb.:	Feb. 13, 1940	Feb. 6, 1940	Jan. 16, 1940	Feb. 14, 1939
Wire nails: Pittsburgh, Chi- cago, Cleveland, Birming- ham	2.55	2.55	2.55	2.45
Plain wire: Pittsburgh, Chi- cago, Cleveland, Birming- ham	2.60	2.60	2.60	2.60
Barbed wire, galv.: Pitts- burgh, Chicago, Cleveland, Birmingham	†3.40	3.40	3.40	3.20
Tin plate, 100 lb. base box: Pittsburgh and Gary	\$5.00	\$5.00	\$5.00	\$5.00

†Applies to 80-rod spools only.

Pig Iron

Per Gross Ton:	Feb. 13, 1940	Feb. 6, 1940	Jan. 16, 1940	Feb. 14, 1939
No. 2 fdy., Philadelphia ...	\$24.84	\$24.84	\$24.84	\$22.84
No. 2, Valley furnace	23.00	23.00	23.00	21.00
No. 2, Southern Cin'ti	23.06	23.06	23.06	21.06
No. 2, Birmingham	19.38	19.38	19.38	17.38
No. 2, foundry, Chicago† ...	23.00	23.00	23.00	21.00
Basic, del'd eastern Pa.	24.34	24.34	24.34	22.34
Basic, Valley furnace	22.50	22.50	22.50	20.50
Malleable, Chicago†	23.00	23.00	23.00	21.00
Malleable, Valley	23.00	23.00	23.00	21.00
L. S. charcoal, Chicago	30.34	30.34	30.34	28.34
Ferromanganese, seab'd car- lots	100.00	100.00	100.00	80.00

†The switching charge for delivery to foundries in the Chi-
cago district is 60c. per ton.

Scrap

Per Gross Ton:	Feb. 13, 1940	Feb. 6, 1940	Jan. 16, 1940	Feb. 14, 1939
Heavy melting steel, P'gh...\$17.75	\$17.75	\$17.75	\$18.50	\$15.75
Heavy melting steel, Phila... 17.50	17.50	17.50	18.00	15.25
Heavy melting steel, Ch'go... 15.75	16.00	16.50	14.00	14.00
Carwheels, Chicago	17.25	16.50	15.75	12.50
Carwheels, Philadelphia	20.25	20.25	20.25	16.75
No. 1 cast, Pittsburgh	18.25	18.75	18.75	15.50
No. 1 cast, Philadelphia	20.25	20.25	20.25	16.75
No. 1 cast, Ch'go (net ton). 14.00	14.00	14.25	12.75	

Coke, Connellsville

Per Net Ton at Oven:	Feb. 13, 1940	Feb. 6, 1940	Jan. 16, 1940	Feb. 14, 1939
Furnace coke, prompt	\$4.00	\$4.00	\$4.00	\$3.75
Foundry coke, prompt	5.25	5.50	5.50	4.75

Non-Ferrous Metals

Cents per Lb. to Large Buyers:	Feb. 13, 1940	Feb. 6, 1940	Jan. 16, 1940	Feb. 14, 1939
Copper, Electrolytic, Conn... 11.25	11.625	12.50	11.25	*
Copper, Lake, New York ... 11.25	11.625	12.50	11.375	
Tin (Strait), New York ... 46.00	45.125	47.00	45.50	
Zinc, East St. Louis	5.50	5.75	4.50	
Zinc, New York	5.89	6.14	4.89	
Lead, St. Louis	5.00	5.35	4.70	
Lead, New York	4.85	5.25	4.85	
Antimony (Asiatic), N. Y. ... 16.50	16.50	16.50	14.00	

The Iron Age Composite Prices

Finished Steel

Feb. 13, 1940
One week ago
One month ago
One year ago

2.261c. a Lb.
2.261
2.261
2.286

Based on steel bars, beams,
tank plates, wire, rails, black
pipe, sheets and hot-rolled strip.
These products represent 85 per
cent of the United States output.

	HIGH	LOW
1940.....	2.286c., Jan. 3;	2.236c., May 16
1939.....	2.512c., May 17;	2.211c., Oct. 18
1938.....	2.512c., Mar. 9;	2.249c., Jan. 4
1937.....	2.249c., Dec. 28;	2.016c., Mar. 10
1936.....	2.062c., Oct. 1;	2.056c., Jan. 8
1935.....	2.118c., Apr. 24;	1.945c., Jan. 2
1934.....	1.953c., Oct. 3;	1.792c., May 2
1933.....	1.915c., Sept. 6;	1.870c., Mar. 15
1932.....	1.981c., Jan. 13;	1.883c., Dec. 29
1931.....	2.192c., Jan. 7;	1.962c., Dec. 9
1930.....	2.236c., May 28;	2.192c., Oct. 29

Pig Iron

\$22.61 a Gross Ton
22.61
22.61
20.61

Based on average for basic
iron at Valley furnace and found-
ry iron at Chicago, Philadel-
phia, Buffalo, Valley and South-
ern iron at Cincinnati.

	HIGH	LOW
1940.....	\$22.61, Sept. 19;	\$20.61, Sept. 12
1939.....	23.25, June 21;	19.61, July 6
1938.....	23.25, Mar. 9;	20.25, Feb. 16
1937.....	19.73, Nov. 24;	18.73, Aug. 11
1936.....	18.84, Nov. 5;	17.33, May 14
1935.....	17.90, May 1;	16.90, Jan. 27
1934.....	16.90, Dec. 5;	13.56, Jan. 3
1933.....	14.81, Jan. 5;	13.56, Dec. 6
1932.....	15.90, Jan. 6;	14.79, Dec. 15
1931.....	18.21, Jan. 7;	15.90, Dec. 16
1930.....	18.71, May 14;	18.21, Dec. 17

Steel Scrap

\$17.00 a Gross Ton
17.08
17.67
15.00

Based on No. 1 heavy melting
steel quotations at Pittsburgh,
Philadelphia and Chicago.

	HIGH	LOW
1940.....	\$17.67, Jan. 2;	\$17.00, Feb. 13
1939.....	22.50, Oct. 3;	14.08, May 16
1938.....	15.00, Nov. 22;	11.00, June 7
1937.....	21.92, Mar. 30;	12.92, Nov. 10
1936.....	17.75, Dec. 21;	12.67, June 9
1935.....	13.42, Dec. 10;	10.33, Apr. 29
1934.....	13.00, Mar. 13;	9.50, Sept. 25
1933.....	12.25, Aug. 8;	6.75, Jan. 3
1932.....	8.50, Jan. 12;	6.43, July 5
1931.....	11.33, Jan. 6;	3.50, Dec. 29
1930.....	15.00, Feb. 18;	11.25, Dec. 9
1929.....	17.58, Jan. 29;	14.08, Dec. 3

THIS WEEK'S MARKET NEWS

STEEL OPERATIONS

... Rate for industry declines three points to 68½%

THE trend of ingot production is still downward, this week's rate for the industry being estimated at 68½ per cent, three points below last week's average. There has been a gain of more than 10 points at Buffalo to 72 per cent, but there have been declines in all other districts excepting WHEELING-WEIRTON, BIRMINGHAM and SOUTHERN OHIO.

At PITTSBURGH the drop is three points to 66 per cent; at Chicago, six points to 69 per cent; in the VALLEYS, three points to 46 per cent; in EASTERN PENNSYLVANIA, five points to 76 per cent; in the CLEVELAND-LORAIN district, three points to 66 per cent; in Detroit, four points to 92 per cent; in the West, seven and a half points to 80 per cent; in the St. Louis district, seven points to 64 per cent, and in the Eastern district, 20 points to 70 per cent.

Several steel company blast furnaces have been banked or blown out.

NEW BUSINESS

... Incoming domestic orders still light ... Export trade promising

INCOMING business at PITTSBURGH consists mostly of in-and-out tonnage and, as a result, weekly sales figures have been highly irregular recently. Aggregate bookings currently would just about support 40 per cent of ingot capacity. Backlogs are being reduced considerably and there is some evidence of moderate stocking of raw steel supplies by some steel companies.

While incoming steel orders at CLEVELAND up to Feb. 12 represented only around 40 per cent of production, sellers find encouragement in several current developments.

Export inquiries are numerous in all products and flat rolled items were sold to Europe last week at an average premium of \$3 per ton above the domestic market. Meanwhile, a few large domestic consumers have been in the market for small tonnages, indicating that manufacturing operations are still holding up fairly well. Allocation of flat rolled steel by Ford

Motor Co. to its regular steel supplying sources did not disturb the price structure.

Another significant development is that a survey conducted by a large steel company to find the relative size of consumer inventories shows a generally healthy condition was prevailing in mid-January, with steel on hand in much better control than in mid-1937. This study of a large and representative group of steel buyers substantiates to a marked degree a similar survey made by THE IRON AGE, published in the Jan. 4 issue, which showed a weighted average of 74 days steel on hand in late November, 1939, in relation to operations. The feature of both studies was the measuring of inventories in terms of days' supply on hand, with reference to operations, a method somewhat different and considered to be more pertinent to the subject than surveys by other agencies.

The opinion is general at CLEVELAND that if the abnormal fourth quarter could be forgotten, the first quarter would be recognized as quite satisfactory. If shipments of steel continued at the January rate, the year 1940 would show a good sized increase over the whole of 1939 and would be more profitable.

The low trend of incoming orders in the CHICAGO district is unchanged. General opinion is that at least another month must pass before a widespread revival of interest in steel products will be seen. Backlogs are being worked down at a fast rate, and at some mills, have nearly disappeared. Virtually all products can be shipped promptly.

CHICAGO consumers as a whole are thought to be using more steel than they are buying, a good sign in that inventories accumulated in late 1939 probably will be at a normal or low level when general purchases are renewed. Contrariwise, a bad sign is that consumers' own orders for goods are said to be declining. Since their backlogs also are being reduced currently, this fact causes them to be as dependent on the spring pickup as the steel companies.

Approximately 85 per cent of the steel on order for railroad car shops in the Middle West has been shipped, and by late March or April, most of the present programs in the car building plants will be complete. Within

the next month new inquiries for cars are expected. If rail earnings are maintained, little doubt is felt that 1940 will be as good a year as last as concerns equipment and rails.

Placing of about 4000 tons of hull and boiler plate requirements of 34 anti-submarine boats being built by Canadian shipyards was the chief item of interest in the EASTERN PENNSYLVANIA market the past week. Domestic buying continues very poor, with the week's volume of both export and domestic bookings equal to slightly under 50 per cent of productive capacity. It is expected that confirmation of the placing of the Ford business at the full market price will release a considerable amount of buying which had been delayed pending the settlement of this purchase. Several substantial inquiries are out for medium forgings for armament work, emanating from domestic concerns. While export pig iron demand is very slow, foreign interest in coke is showing signs of a revival, with Norway interested in purchasing 7000 tons of by-product material. Last month several boatloads of furnace coke were shipped to France.

While the first quarter of 1940 has been sluggish at ST. LOUIS, it is expected that the second quarter will show a marked improvement. Consumers have been proceeding with caution, buying only what they actually require for specific jobs or to round out inventories, feeling that there is no need for forward buying, in view of the stable price situation.

NEW ENGLAND industrial activity is holding up remarkably well especially in metal consuming lines. The foundry industry is still operating around 80 per cent of rated capacity, with machine tool, airplane engine and automobile parts castings in greatest demand, and special machinery parts a good second.

PRICES

... Flat rolled structure survives test of Ford purchases

THE flat rolled steel price structure survived an important test when Ford Motor Co. allocated about 20,000 tons Monday to its regular steel suppliers.

Export prices are reported still good, with domestic level at least be-

ing obtained and in some instances \$3 a ton above domestic prices.

Bids on a recent inquiry for 1000 tons of basic iron for a Philadelphia foundry were all at published prices.

Prices in CHICAGO are firm, except on reinforcing steel and fabricated shapes. Mills seem determined to maintain the existing published price structure on other products. It is understood here that the \$2 a ton concession on the part of hand mills in the Detroit area applies only to 19 to 22 gage inclusive hot rolled pickled sheets. Since the net price of these sizes is the same as mill run cold rolled sheets in those gages, the competitive difficulty faced by the hand mills is obvious.

SEMI-FINISHED STEEL

... Non-integrated mills buying a little more freely

A SLIGHT pick up in general buying by non-integrated mills has been noted following quietness during the past few weeks. The sales volume, however, is expected to be highly irregular over the next several weeks and in many cases will probably represent balancing out of regular inventories. The extra for special aircraft quality on alloy steel blooms, billets and slabs was revised upward recently from \$20 a ton to \$30 a ton.

PIG IRON

... Some furnaces are being taken out of blast

CARNEGIE-ILLINOIS STEEL CORP. has blown out another furnace this week at Duquesne and last week took one out at Clairton, also No. 2 blast furnace at the Ohio works of Carnegie-Illinois Steel Corp.

Jones & Laughlin Steel Corp. has blown out a blast furnace at its Pittsburgh works.

What is considered to be a pig iron production record in this country was the production of 2,874,870 gross tons of pig iron on a single lining by No. 2 blast furnace at the Ohio works of Carnegie-Illinois Steel Corp. This furnace was blown out last week after having operated continuously since May, 1929, with the exception of a 92-day shutdown. During the shutdown the top brick work in the furnace was replaced down to 5 ft. below the stock line. This minor repair is considered by blast furnace men not

to be a factor in the establishment of a record for production on a single lining. Data on No. 2 furnace include height, 102 ft., hearth 25 ft., and bosh 28 ft. It was constructed about 1899.

February shipments of pig iron to date in the CHICAGO district are down slightly from the previous month, and a continuation of this trend is expected. Foundry melt, however, apparently is not declining as shipments of foundry coke are somewhat higher than a month ago. Pig iron inventories obviously are being drawn upon by the foundries to maintain the rate of melt. The low level of spot sales is unchanged.

Both Gary and South works of Carnegie-Illinois banked blast furnaces last week, 26 stacks of that district's total of 38 continuing in blast.

The Mystic Iron Works has blown out its furnace at Everett, Mass., due primarily to a coke situation. The furnace consumes approximately 400 to 450 tons of coke a day, and because of extremely low temperatures the New England Coke Co., which supplies the furnace with fuel, has been hard put to keep up with domestic coke orders. The furnace management also felt it had a sufficient stock of iron on hand to take care of nearby demands. There has been some new buying of iron in NEW ENGLAND for February and March delivery, but it is not a real buying movement as yet. Shipments against contracts placed heretofore continue active.

So many export inquiries are current, according to CLEVELAND pig iron sellers, that it seems like a good European export market will develop before long. Some of the inquiries are obviously feelers and come from agents having no definite commitments. It is a question whether necessary bottoms will be available in the spring for export shipments. Domestic foundry coke deliveries of CLEVELAND sellers are up 20 per cent over January but for this month as a whole will probably average between 10 and 20 per cent. Pig iron sellers derive encouragement from the fact important melters have been in the market recently for small tonnages.

Shipments of pig iron in the St. Louis area since the start of the year have been disappointing, and have not kept apace with the melt because of heavy takings in the last quarter of 1939. While there have been no cancellations, some shipments scheduled for January and February have been held up. Sales are few.

At CINCINNATI melters are purchasing only for short periods, apparently

in the belief that prices are now well established and a further rise is not likely. Shipment rates are lower than during December, but the past week showed a moderate improvement over the January rate. Machine tool operations continue to hold the melt at good level, while some automotive foundries are also fairly active.

Shipments against old contracts in EASTERN PENNSYLVANIA are running slightly ahead of January, but actual melting operations are just about on a par with January. The bulk of these deliveries is against \$22 contracts and at the present rate of shipment these low-priced contracts will not be cleaned up until late March. All bids on a recent inquiry by a local plant for 1000 tons of basic were at published levels. This business has not yet been closed.

Export interest in by-product coke is expanding. An order for about 300 tons was recently booked for Europe and Norway is reported to be seeking prices on 7000 tons.

MERCHANT BARS

... New business is light ... Backlogs being depleted

HOT rolled bar specifications at PITTSBURGH have sagged slightly this week and total bookings so far this month are lower than in the same period of January. Shipments continue relatively heavy with backlogs being rapidly depleted.

Incoming business at CLEVELAND so far this month has been ahead of the comparable January period, although this comparison means little, because of the low volume during the first month of the year. Fair export inquiry is being received. The agricultural implement industry continues active, resulting in moderate fill-in orders from time to time. Cold finished prices are firm with principal buying support emanating from the automotive, machine tool and munitions fields.

Bar orders are being received at CHICAGO sales offices at a greatly reduced rate from a few weeks ago, even though one of the largest bar consumers, the farm equipment industry, is still operating well. Prompt deliveries are available in most sizes. A few mills have a fair amount of tonnage booked ahead, but this backlog is fast being reduced.

The extra for special aircraft quality on hot rolled alloy steel bars has been advanced from \$1 per 100 lb. to \$1.50 a 100 lb. recently.

STRUCTURAL STEEL

... Awards of fabricated jobs total 21,700 tons ... one job 16,600 tons

FABRICATED structural steel lettings of 21,700 tons compare with 28,900 tons last week. Awards of size include 17,760 tons for the Pit River bridge in California and 1215 tons for the Dooker Hollow bridge, Pittsburgh.

Structural steel projects declined to 11,330 tons from 13,700 tons in the previous week. Sizable inquiries are light and include only 3000 tons for a Boston Navy Yard building, and 1100 tons for buildings for the Buick Motor Car Division of General Motors Corp., Flint, Mich.

Public construction in the vicinity of CHICAGO is holding fairly well, but private projects are scarce. Available tonnage is so small that fabricators have had no opportunity to secure better prices.

The past week brought a slight pickup in buying by fabricators in the St. Louis district. Nearly all of it was in lots up to 30 tons, required for miscellaneous jobs or to round out stocks. Oklahoma opened bids for highway bridges totaling 2600 tons, the largest being 1100 tons.

Structural steel specifications at PITTSBURGH continue to decline.

SHEETS AND STRIP

... Ford buys tonnage at full published prices

IT is reported from Detroit that the Ford Motor Co.'s purchases of steel within the past few days included not more than 20,000 tons of flat rolled steels. The business is said to have been divided among a number of Ford's regular suppliers at full published prices. Thus the sheet and strip market has survived the first important test of the new year.

Total sheet and strip business at PITTSBURGH in the past week has been no heavier than a week ago and, although renewed automotive buying is expected soon, producers look for no change in miscellaneous demand for several weeks at least. In some cases consumers with orders on the books have requested that deliveries be made at a latter date than originally specified.

Orders continue below capacity at CLEVELAND and shipments are falling. Moderate tonnages of sheets were sold

last week for shipment to Holland, Sweden and other European countries. Despite the fact some automotive buying was held back pending clarification of bids made to Ford Motor Co., several small Detroit orders were received last week.

New orders for flat rolled products in CHICAGO continue in light volume. Three or four weeks hence is about the earliest that a general increase in sheet specifications is being predicted. Deliveries to CHICAGO district consumers of all grades of sheets are fairly prompt.

Jobbers in the St. Louis area report that the rise in temperatures has brought more business in galvanized sheets, but they desire a further liquidation of their stocks before making new commitments. A slight pickup in demand for strip steel is reported from St. Louis. This is due mostly to a desire to round out inventories.

A moderate improvement in the galvanized sheet demand in the SOUTHERN OHIO district tends to offset slight declines in other grades. Some automotive demand is trickling into the market and mill operators indicate that interest from this source should produce substantial ordering by the end of the current month.

New business in sheets in the NEW YORK district thus far in February has been running under the weekly January average. Some buyers have been feeling out the market for possible price weakness, but have ended up by placing orders at the published price. Shipments are fairly well maintained, particularly by those mills which scheduled substantial tonnages last fall for first quarter shipments at a price prevailing at time of shipment. Jobber buying has shown a slight pickup. Some encouragement is lent by the continued high rate of stove and refrigerator manufacturing.

... PLATES ...

... Backlogs for railroad work are dwindling

PLATE backlogs are dwindling rapidly as more and more of the tonnage ordered by car building shops is shipped. By April at the latest the major current car programs should be finished, but before then new inquiries are expected to be seen, so that plate demand is potentially good for a month or so hence. Structural fabrication is not requiring an important tonnage.

Plate specifications at PITTSBURGH have declined recently and fairly prompt shipment is now being made. Backlogs have been reduced substantially since the first of the year, and the major portion of car material still on order will probably be cleaned up within the next 40 days or sooner.

Plate backlogs generally are low at both CLEVELAND and YOUNGSTOWN with the exception of one producer rolling light plates on a high speed mill. A project of interest involves 800 tons for the city of Toledo, Ohio, for a 42-in. pipe line section with bids due Feb. 26.

About 4000 tons of boiler and hull plate for the 34 anti-submarine boats being built in Canada were distributed among several EASTERN PENNSYLVANIA mills in the past week at the domestic price level. Additional tonnage was placed with mills in other districts. Total steel requirements of these 34 boats approximate 8500 tons of hull material and 3400 tons of boiler plate. Export bookings, principally from Scandinavia and Holland, by the EASTERN PENNSYLVANIA producers continue to hold up at a fairly good pace, but domestic buying is poor. However, close to 11,000 tons of ship plates is expected to be allocated shortly by two Atlantic Coast shipyards. Domestic prices are holding firm at 2.10c.

BOLTS, NUTS AND RIVETS

... Canadian shipyard inquires in U. S. for rivets

RIVET makers at CLEVELAND report the receipt of inquiries arising from the Canadian shipbuilding program. In addition there are several important Navy jobs outstanding for the U. S. Government. Bolt and nut manufacturers continue to work down their backlogs. Incoming business is reported a little better than late December and represents approximately 50 per cent of current production. Orders are diversified.

WAREHOUSE BUSINESS

... Upward trend of purchases noted at Pittsburgh

WAREHOUSE sales at PITTSBURGH in January were 15 to 20 per cent below December sales volume. In the past two weeks, however,

aggregate purchases have been on a level comparable with those maintained in the closing weeks of January. Demand continues widely diversified with accent on bar tonnages.

TUBULAR GOODS

... Mill stocks are being replenished ... orders fair

TOTAL tubular sales at PITTSBURGH are about on a par with a week ago. Oil country goods specifications are about equal to the volume placed in recent weeks. Some pipe producers are building up depleted stocks at plants and warehouses which, to some extent, has been retarded recently owing to river conditions.

SHIPBUILDING

... Socony-Vacuum to build six tankers with U. S. aid

THE Maritime Commission announces that construction of six national defense tankers will be begun soon for the Socony-Vacuum Oil Co., of New York. Approximately 31,000 tons of steel will be required for the six vessels.

Part of a 24-tanker program to be undertaken by private operators with government assistance, the new ships will be similar to tankers already under construction, the first 12 of which are nearing completion. These were built by the Standard Oil Co., of New Jersey, at a cost of \$3,129,667, with the Maritime Commission paying \$880,250 for the incorporation of certain defense features in their design.

Approximately 24,000 tons of steel will be required for the construction of two trans-Pacific luxury liners for which the Maritime Commission invited bids on Tuesday. The bids will

be opened on May 7. The ships will be operated from San Francisco to the Orient. They will be the largest ever built in an American yard and will be capable of being converted quickly into aircraft carriers in an emergency.

REINFORCING BARS

... Awards total 11,225 tons, inquiries 11,550 tons

REINFORCING steel awards call for 11,225 tons and include 7500 tons for a building for the South Side filtration plant at Chicago; 1365 tons for quartermaster supplies, Brooklyn; 1260 tons in New York for the Procurement Division of the Treasury Department, and 1100 tons for a city hospital, St. Louis.

Reinforcing steel projects total 11,550 tons. The largest inquiries are 4000 tons for officers' quarters and barracks in the Canal Zone; 2350 tons at Odair, Wash., for the Grand Coulee Dam, and 1300 tons for a War Department building in Washington.

TIN PLATE

... Operations lower at 60%

TIN plate operations this week are estimated at 60 per cent, down three points from a week ago. The total volume of specifications is changed but little from last week but backlogs are being steadily reduced.

RAILROAD BUYING

... Prospective business confined to a few small inquiries

NO new equipment purchases were reported in the past week and only three small inquiries were issued. These inquiries covered 10 dump cars for Utah Copper Co., 50 70-ton cov-

ered hopper cars and 10 100-ton container gondolas for the Nickel Plate Railroad, and two gondolas and six hopper cars for National Tube Co.

Eastern Massachusetts Street Railway Co. has ordered two motor cars from A.C.F. Motors Co.

WIRE PRODUCTS

... Some requests come in for delayed deliveries

THERE has been little or no change in volume at PITTSBURGH in the number of wire sales in the past week. Some requests have been made by customers for delaying deliveries on material already booked. Merchant wire sales have improved only slightly with spring requirements still in the future.

Continued slow improvement is noted in sales of merchant wire products by CLEVELAND producers. Revision of a few extras and more favorable weather in several areas are partly responsible. Export inquiry has broadened, leading to the belief some good-sized sales are probable in the near future.

Weir Sees Ingot Average Near 70% for First Half of '40

PITTSBURGH — The industry's steel ingot rate will not average lower than 60 per cent of capacity in the current decline, and the rate will not average more than 70 per cent for the first half of this year, according to E. T. Weir, board chairman, National Steel Corp.

"I doubt if operations will reach 70 per cent but they will average close to it following a recovery from the decline we are experiencing now," Mr. Weir said here.

Weekly Bookings of Construction Steel

	Week Ended				Year to Date	
	Feb. 13, 1940	Feb. 6, 1940*	Jan. 16, 1940	Feb. 14, 1939	1940	1939
Fabricated structural steel awards	21,760	28,900	13,625	9,100	105,760	139,450
Fabricated plate awards	0	1,575	120	275	23,135	25,700
Steel sheet piling awards	100	2,000	250	0	2,450	7,960
Reinforcing bar awards	11,225	13,100	1,365	5,825	54,270	79,795
Total Letting of Construction Steel..	33,085	45,575	15,360	15,200	185,615	252,905

FABRICATED STEEL

... Lettings in fair volume at 21,760 tons ... New projects decline to 11,330 tons from 13,700 tons last week.

NORTH ATLANTIC STATES AWARDS

- 1215 Tons, Pittsburgh, Dooker Hollow bridge, to Pittsburgh-Des Moines Steel Co., Pittsburgh.
- 235 Tons, Maplewood, Mass., storage building for Friend Brothers, to A. E. Wilson Structural Steel Co., Boston.
- 200 Tons, Washington, Massachusetts Avenue bridge, to Bethlehem Steel Co., Bethlehem, Pa.
- 182 Tons, Cohoes, N. Y., Mohawk paper mill, to Utica Structural Steel, Utica, N. Y.
- 130 Tons, Buffalo, manufacturing and storage building for American Sales Book Co., to R. S. McMannus Steel Construction Co., Buffalo; previously reported to Austin Co.

THE SOUTH

- 155 Tons, Perry County, Tenn., bridge FAP-489, to Bristol Steel & Iron Co., Bristol, Va.
- 140 Tons, Lee County, Ark., bridge FAGH 191-D (2), to Clinton Bridge & Iron Co., Clinton, Iowa.
- 125 Tons, Benton, Ark., bridge FAP 452 (A), to Arkansas Foundry—sublet to Virginia Bridge Co., Roanoke, Va.
- 120 Tons, Cleveland, Tenn., Harwick Stove Works, to International Steel Co., Evansville, Ind.
- 115 Tons, Shelby County, Tenn., bridge FAP-492-A (1), to Virginia Bridge Co., Roanoke, Va.

CENTRAL STATES

- 740 Tons, Edwards County, Ill., bridge, to Joseph T. Ryerson & Son, Inc., Chicago.
- 510 Tons, Petersburg, Ill., State bridge, to Bethlehem Steel Co., Bethlehem, Pa.
- 294 Tons, Milwaukee, post office, to Worden-Allen Co., Milwaukee.
- 165 Tons, Youngstown, Ohio, municipal airport hangar, to Sause Engineering Co., Youngstown.
- 111 Tons, Ames, Iowa, women's gymnasium, Iowa State University, to Iowa Steel & Iron Works, Cedar Rapids, Iowa.

WESTERN STATES

- 16,660 Tons, Pit River bridge, Shasta Dam project, to American Bridge Co., Pittsburgh.
- 236 Tons, San Jose, Cal., Polhemus Street underpass, to Judson-Pacific Co., San Francisco.

HAWAII

- 500 Tons, Pearl Harbor, gantry crane for new graving docks, to Judson-Pacific Co., San Francisco, through Pacific Bridge Co., San Francisco, and Hawaiian Dredging Co., Honolulu, contractors.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

- 3000 Tons, Boston, Navy Yard building.
- 910 Tons, Perth Amboy, N. J., Thomas Edison bridge; English & Estoe, contractors.
- 810 Tons, Kingston, Pa., Toby Outlet works; bids taken.
- 500 Tons, Philadelphia, material testing laboratory, Navy Department; bids close Feb. 20.
- 330 Tons, Marcus Hook, Pa., cracking and combustion case supports for Sun Oil Co.
- 330 Tons, Dundalk, Md., bottling plant for Frankfort Distilleries.
- 300 Tons, Philadelphia, rebidding on Kresge store.
- 300 Tons, Sidney, N. Y., building additions for Scintilla Magneto Co.
- 270 Tons, Old Forge, Pa., State bridge, route 35055.
- 250 Tons, Lackawanna County, Pa., highway bridges.
- 200 Tons, Bridgeport, Conn., housing project.
- 140 Tons, Erie County, Pa., highway bridge.
- 110 Tons, Waterbury, Conn., building addition for St. Mary's Hospital.

THE SOUTH

- 2600 Tons, State of Oklahoma, highway bridges; low bidders: Custer County, 1100 tons, Moran & Buckner; Harper County, 310 tons, Brooks & Dahlgren, Oklahoma City; Bryan County, 248 tons, O. J. Pharoah, Henrietta, Okla.; Mayes County, 295 tons, Glen E. Blas, Tulsa; Pittsburg County, 151 tons, Lewis Construction Co.,

Muskogee, Okla.; Cordell County, 197 tons, F. D. Ford, Cordell, Okla.

- 500 Tons, Louisville, Ky., building and building alterations, for Jos. E. Seagram & Son.
- 500 Tons, Rock Hill, S. C., State bridge over Catawba River.
- 250 Tons, Gravel Switch, Ky., material for TVA navigation lock.
- 200 Tons, Iva-Antreville, S. C., Rocky River State bridge.

CENTRAL STATES

- 1100 Tons, Flint, Mich., buildings for Buick Motor Car Division, General Motors Corp.
- 350 Tons, Toledo, Ohio, chemical building for city.
- 250 Tons, Dubuque, Iowa, bridge for Illinois Central Railroad.
- 200 Tons, Middletown, Ohio, office building for American Rolling Mill Co.; F. H. McGraw, low bidder.
- 180 Tons, Chicago, eight mezzanine sections, Dearborn Street subway, bids Feb. 29.
- 150 Tons, Toledo, high service pumping station for city.
- 125 Tons, Chicago, addition for Armour & Co.
- 125 Tons, Toledo, low service pumping station for city.

WESTERN STATES

- 150 Tons, Hot Springs County, Wyo., bridges on Meeteetse-Thermopolis Road; bids Feb. 20.

FABRICATED PLATES

Pending Project

- 800 Tons, Toledo, 42-in. pipe for city; bids Feb. 26.

SHEET PILING

AWARDS

- 100 Tons, Licking County, Ohio, State project No. 274, to Foster Co., Pittsburgh, through Purdy Construction Co., Mansfield, Ohio.

... PIPE LINES ...

Southern Natural Gas Co., Birmingham, plans new welded steel pipe line from Calhoun, Ga., to Chattanooga, Tenn., about 50 miles, for natural gas transmission for local distribution, which will be carried out by Chattanooga Gas Co., Chattanooga. New line will connect with main transmission system of company at point near Plainville, vicinity of Rome, Ga. Booster stations will be installed. Work is scheduled to begin soon. Cost close to \$500,000 including control and meter station at Chattanooga city limits, and other operating facilities.

Dow Chemical Co., Midland, Mich., has let contract to Gentry Engineering Co., Jackson, Mich., for new 6-in. welded steel pipe line from Temple oil field area, Clare County, to Midland, about 55 miles, for natural gas transmission for plant service. Booster stations will be installed along route. Entire project will cost about \$400,000.

Board of District Commissioners, District Building, Washington, asks bids until Feb. 23 for 48-in. steel trunk water main, with accessories, from point in grounds of U. S. Soldiers' Home to District pumping station at Second and Bryant Streets, N.W., with alternate bids on same size reinforced-concrete and cast iron pipe, respectively.

Amsco Pipe Line Co., Heep Building, Corpus Christi, Tex., has let contract to Petty Pipe Line Construction Co., Nixon Building, for new 6-in. welded steel pipe line from La Rosa oil field district, Refugio County, Tex., to port district at Corpus Christi, for crude oil transmission. Also will build branch lines from La Rosa field to East White Point, Plymouth and Taft oil field districts in San Patricio County, Tex., connecting with new main line to Corpus Christi. Gathering pipe lines will be installed in oil districts noted, as well as pumping stations and other operating facilities.

Center, Tex., has issued call for bids for installation of pressure pipe line system for municipal gas distribution, with control station, meter house, etc. Cost about \$50,000.

General Purchasing Officer, Panama Canal, Washington, closes bids Feb. 26 for 300 ft. of 4½-in. galvanized steel pipe; also for 100 ft. of 16-in. cast iron pipe (Schedule 3894).

Thibodaux, La., is considering a proposal made by Williams Brothers Co., National Bank of Tulsa Building, Tulsa, Okla., pipe line contractor, for installation of a pressure pipe line system for municipal natural gas distribution, including welded steel pipe line for connection with supply source.

Steel Shipments Drop 298,377 Tons

FINISHED steel shipments by United States Steel Corp. subsidiaries during January totaled 1,145,592 net tons, a decrease of 298,377 tons from the December total of 1,443,969, but 274,726 tons above the total of 870,866 tons shipped in January, 1939. Totals in net tons for January, 1938, were 570,264; January, 1937, 1,268,403; January, 1929, 1,364,801 tons. The corporation has changed from a gross ton to a net ton basis in reporting shipments.

Mills Raw Steel Inventories Up 6%

DESPITE higher operating rates late in 1939, inventories of steel ingots and semi-finished steel at mills of representative companies on Jan. 1, 1940, were only 6 per cent greater than at the close of 1938, according to a study by the American Iron and Steel Institute. In relation to the actual rates of production, such inventories were much smaller. Steel mills' stocks of pig iron on hand Dec. 31, 1939, were about 33 per cent below the tonnage in inventory as 1938 ended.

At the close of 1937 inventories of ingots and semi-finished steel were about 9 per cent below the total a year earlier. Although stocks increased somewhat during both 1938 and 1939, the tonnage on hand at the close of last year was only 7 per cent greater than was inventoried at the end of 1936.

J. & L. Earns \$2,907,755 In Fourth Quarter

JONES & LAUGHLIN STEEL CORP., Pittsburgh, reports net profit of \$3,188,944 for 1939, compared with a loss of \$5,879,958 for 1938. For the quarter ended Dec. 31, 1939, the company showed a net profit of \$2,907,755 compared with a net loss of \$1,129,856 for the corresponding 1938 quarter.

...NON-FERROUS...

... Copper cut to 11.25c., Valley ... Lead down \$5 a ton
... Tin strengthens ... Zinc unchanged.

NEW YORK, Feb. 13—Additional adjustments in non-ferrous prices made in the past week served to further increase the uncertainty which has prevailed for the past three weeks. Most important of these adjustments was in copper prices. Reports of sales below the published price of 11.625c., Valley, caused the leading mine producers to lower their quotations on Wednesday to 11.25c., Valley. At the same time, the leading custom smelter discontinued the practice of posting prices and indicated that this ac-

tion was taken to enable it to sell "at the market" at all times. While some apprehension was created by the smelter's move, more mature deliberation gave rise to the opinion that this action was simply a realistic solution of the problems presented by the confusing market conditions currently prevailing and did not presage a price war. All during this period of price alterations, consumers remained on the sidelines, buying very little metal. Although early in the week, some business was done in the open market at

11.125c., quotations hardened on Friday and practically all interests were quoting on the 11.25c. basis.

Lead

Another cut of \$5 a ton on Wednesday brought prices down to 5c. per lb., New York. Immediately following this reduction, consumers began buying heavily in March and several sellers developed substantial waiting lists. The demand was well diversified and the week's total sales were substantially above the average of the preceding three weeks. The demand today was still fairly strong, with about 1/3 of the buying for February positions and the balance for March.

Zinc

Although smelter prices remained unchanged all week, there was little change in the dull buying pace of the past month. Shipments, however, continued fairly heavy and unfilled orders declined further. With producers' stocks at present equal to about only a month's consumption, the trade feels that a resumption of buying on a fairly substantial scale is due momentarily. Quotations at the close of the week were firm at 5.89c. per lb., New York.

Tin

Prices continued to move upward during the week, reaching a high of 46c. per lb., New York, today. The advance was due largely to the conservative attitude adopted by sellers pending the outcome of the meeting of the International Control Committee. The expectation of lower quotas sent London higher today, with cash standards reaching £242 5s. Trading, meanwhile, continues very light, with the tin mills being about the only consumers showing any interest at all in the market.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Feb. 7	Feb. 8	Feb. 9	Feb. 10	Feb. 13
Copper, Electrolytic ¹	11.25	11.25	11.25	11.25	11.25
Copper, Lake	11.25	11.25	11.25	11.25	11.25
Tin, Straits, New York	45.125	45.00	45.25	....	46.00
Zinc, East St. Louis ²	5.50	5.50	5.50	5.50	5.50
Lead, St. Louis ³	4.85	4.85	4.85	4.85	4.85

¹ Delivered Conn. Valley. Deduct 1/4c. for New York delivery. ² Add 0.39c. for New York delivery. ³ Add 0.15c. for New York delivery.

Warehouse Prices

Cents per lb., Delivered

	New York	Cleveland
Tin, Straits, pig	46.25c.	48.50c.
Copper, Lake	13.00c.	12.75c.
Copper, electro	12.50c.	12.75c.
Copper, castings	12.125c.	12.375c.
*Copper sheets, hot-rolled	19.87c.	19.87c.
*Yellow brass sheets ..	18.15c.	18.15c.
*Seamless brass tubes ..	20.90c.	20.90c.
*Seamless copper tubes ..	20.37c.	20.37c.
*Yellow brass rods	14.11c.	14.11c.
Zinc slabs	6.85c.	7.50c.
Zinc sheets, No. 9 casks	12.00c.	13.35c.
Lead, American pig ...	6.00c.	5.50c.
Lead, bar	8.45c.	8.25c.
Lead, sheets, cut	8.50c.	8.50c.
Antimony, Asiatic	16.00c.	17.00c.
Alum., virgin, 99 per cent plus	21.50c.	22.50c.
Alum., No. 1 remelt., 98 to 99 per cent	19.00c.	19.50c.
Solder, 1/2 and 1/2	29.00c.	28.375c.
Babbitt metal, anti-friction grade	27.50c.	26.00c.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33 1/4; on brass sheets and rods, 40; on brass tubes, 33 1/4, and copper tubes, 40.

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible ..	9.25c.	9.875c.
Copper, hvy. and wire ..	8.25c.	8.625c.
Copper, light and bottoms	7.25c.	7.75c.
Brass, heavy	5.00c.	5.50c.
Brass, light	4.125c.	4.875c.
Heavy machine composition	7.375c.	8.00c.
No. 1 yel. brass turnings ..	4.75c.	7.75c.
No. 1 red brass or composition, turnings	7.00c.	7.50c.
Lead, heavy	4.00c.	7.375c.
Cast aluminum	8.00c.	9.00c.
Sheet aluminum	13.75c.	14.75c.
Zinc	2.75c.	4.00c.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 20c.-21c. a lb.; No. 12 remelt No. 2 standard, 19c.-19.50c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICK-SILVER, nominally, \$180 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 11.75c. a lb.

American Bridge Co. Awarded 17,760-Ton Project in West

WASHINGTON--The American Bridge Co. on Tuesday was awarded a contract by the Bureau of Reclamation for the construction of the double-deck superstructure of the Pit River bridge, closing-link in the 30-mile railroad relocation being built around the Shasta Reservoir site, Central Valley project, California. The contract price was \$2,588,354, and the project construction involves 17,760 tons of steel. It will include 9770 tons of silicon and 6825 tons of carbon steel, 650 tons of reinforcement bars and 515 tons of cast steel pins and rockers. This combination railroad and highway bridge will be two-thirds of a mile long and the highest double-deck bridge in the world. The upper deck will be about 500 ft. above the present level of Pit River.

IRON AND STEEL SCRAP

... Absence of mill buying and declining operations continue to depress market ... Composite off 8c. to a flat \$17.

FEB. 13—Continued lack of interest on the part of the mills has kept the market soft, and the few mill sales that have been made in the past week have warranted lower quoted prices. Although the price of No. 1 steel at both Pittsburgh and Philadelphia is unchanged, the undertone remains weak at both points. The average on No. 1 steel is off 25c. at Chicago, based on broker-dealer transactions, weeks having passed since the last mill sale. As a result, the composite price of No. 1 is down 8c. to a flat \$17, making a total decline since Jan. 16 or 67c., a relatively small movement considering the drop of 16½ points in the steel operating rate since that date.

A sale of 2000 tons of assorted material to a Buffalo consumer has resulted there in a lowering of nearly all quotations 50c. Similarly, a sale of 5000 tons of No. 2 at St. Louis has caused dealers to lower their buying prices 25c. Cincinnati dealers also have lowered buying prices 25c. because of lack of mill buying. Prices at Youngstown and Cleveland are off 50c. on the average, reflecting largely the weakness that developed at Pittsburgh the previous week. Prices on the principal grades at Birmingham have dropped \$1, following a small mill purchase. Boston prices are also notably weaker.

Pittsburgh

The market undertone continues weak and, although No. 1 heavy melting is quotably unchanged this week, current prices are expected to get a test soon. Secondary grades are weaker due to absence of demand and current quotations on such items as machine shop turnings, cast iron borings and mixed borings and turnings are nominal. A subsidiary of one of the large steel units recently sold a portion of its current scrap production including low phos. grades in the open market.

Chicago

Another week of mill inactivity has passed and broker-dealer transactions are on a weaker plane again, heavy melting being quoted at \$15.50 to \$16. No mill sales have been recorded since the \$16.50 purchase but the average broker buying price is \$15.50. Some purchases as low as \$15 have been reported but this price is an exception. Brokers look for a highly active period in the spring. Virtually all prices quoted at Chicago are nominal.

Philadelphia

The market here continues to mark time and aside from a few downward

revisions in the secondary grades, the price situation is unchanged. With open-hearth schedules still moving downward, buyers are inclined to view the market bearishly. On the other hand, the recent cold weather has cut down yard accumulations and there are no large tonnages pressing on the market. A few small lots of heavy breakable were bought during the week at \$18 and a moderate tonnage of machine shop turnings were purchased at slightly less than \$12.

Youngstown

Apparently affected by the recent weakness at Pittsburgh, dealers here late last week began making offerings of No. 1 heavy melting steel to mill buyers at around \$17.50 per ton, a decline of 50c. from a transaction several weeks earlier. Open-hearth operations are off again from last week's level.

Cleveland

Scrap has drifted lower here, lacking support of fresh sales and being affected by weaknesses in other Middle Western areas. No. 1 heavy melting is now quoted \$16.50 to \$17 per ton and other open-hearth grades are down correspondingly. Cast materials are unchanged, however. Foundry grades retain some strength due to modest recent sales to a few melters whose operations apparently are holding up.

Buffalo

A sale of approximately 2000 tons of assorted material was made this week to the largest consumer in the district at a price which places No. 1 heavy melting steel within a range of \$16 to \$16.50. At the same time a second smaller purchase was made of a premium grade No. 1 steel by another district consumer at prices higher than this range. A small amount of cast scrap has been sold recently.

St. Louis

An East Side steel mill bought approximately 5000 tons of No. 2 steel for 60-day shipment from four St. Louis dealers at 25c. a ton below the preceding week's quotations. Higher temperatures are causing a heavier movement of scrap, resulting in an easier market. Melting grades are 25c. to 50c. a ton lower. Railroad lists: Southern, 5400 tons; Wabash, 1600 tons; Gulf Coast Lines, 800 tons; Missouri Pacific, 760 tons, and Ann Arbor, 400 tons.

Cincinnati

Lack of mill interest weakened the local scrap market still further during the past week as a result of which dealers have reduced bids another 25c. The trade generally reports that the market is all but at a standstill with only small amounts of material moving on old contracts and no new buying at all. Dealer activity is confined to trading for fill-in on yard supplies or to retain usual

sources of supply. No improvement is expected before the first of next month.

Birmingham

Further weakness in the scrap market is reflected in a price drop of \$1 for No. 1 heavy melting and a like sum for No. 2. The former is available at \$15 and the latter at \$14. Republic came into the market for a small tonnage, with the Tennessee company remaining out of the market. Dealers say that accumulations are light.

Detroit

The end of this week will bring bids on Fisher Body lists which estimate tonnages for the forthcoming 30 days about 10 per cent below the January list. While the principal consumer in this area is still taking delivery of scrap, there is very little buying activity. However, Canadian foundries and dealers have been probing around in Detroit. One detriment to possibilities across the border, however, is the current exchange rate. On the basis of recent minor sales heavy breakable cast quotations are on the low side. Automotive die requirements which will be active very shortly are likely to push the cast iron prices upward moderately. However, so far there is not sufficient data to warrant any changes in quotations.

New York

Delays and uncertainties regarding vessel arrivals continue to plague the exporters and probably will until peace is restored in Europe. It is understood, however, that adjustments are being made to cover demurrage charges of material held on cars or in barges past the due date. Material is coming out none too freely at present buying prices, which have been unchanged in many weeks, but the flow is about keeping up with the belated vessel schedules. For domestic shipment, steel turnings are much softer and are quoted at a flat \$7 on cars this week, as against \$7.50 to \$8 previously. Not much material is flowing to eastern Pennsylvania.

Boston

With consumers indifferent, the market has slumped. Prices for domestic delivery are lower than they have been in months. The export movement is increasing, but shippers are still well covered on material, although one is inquiring for scrap to load at Providence. A boat has just left Boston for England, and two others are loading. A boat will leave Providence this week for Spain, and another will start loading for an unnamed European port.

Toronto

A better tone developed in the scrap markets during the week, with improvement in sales of both steel and iron materials. Foundries and other consumers of cast scrap were more active, with orders for spot and future delivery. Stove plate continued to attract attention. Mills and electric operators were responsible for better sales of heavy melting and low-phos. steel, and there was good buying of soft steel scrap by St. Catharine's consumers. Offerings of scrap were more active during the week with better deliveries from rural holders.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$17.50 to \$18.00
Railroad heavy melting	18.00 to 18.50
No. 2 heavy melting	16.00 to 16.50
Railroad scrap rails	18.00 to 18.50
Rails 3 ft. and under	20.50 to 21.00
Comp. sheet steel	17.50 to 18.00
Hand bundled sheets	16.50 to 17.00
Heavy steel axle turn.	15.50 to 16.00
Machine shop turnings	10.50 to 11.00
Short shov. turnings	12.50 to 13.00
Mixed bor. & turn.	8.50 to 9.00
Cast iron borings	8.50 to 9.00
Heavy iron carwheels	18.50 to 19.00
Heavy breakable cast.	15.00 to 15.50
No. 1 cupola cast	18.00 to 18.50
RR. knuckles & coup.	20.50 to 21.00
Rail coil springs	21.00 to 21.50
Rail leaf springs	21.00 to 21.50
Rolled steel wheels	21.00 to 21.50
Low phos. billet crops	21.50 to 22.00
Low phos. punchings	21.00 to 21.50
Low phos. heavy plate	19.50 to 20.00
Railroad malleable	21.00 to 21.50

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$17.00 to \$18.00
No. 2 hvy. mltng. steel	16.00 to 16.50
Hydraulic bund., new	17.00 to 18.00
Hydraulic bund., old	14.00 to 14.50
Steel rails for rolling	20.50 to 21.00
Cast iron carwheels	20.00 to 20.50
Hvy. breakable cast.	18.00
No. 1 cupola cast	20.00 to 20.50
Mixed yard (f'd'y) scrap	16.50 to 17.00
Stove plate (steel wks.)	15.00
Railroad malleable	21.00 to 22.00
Machine shop turn.	11.50 to 12.00
No. 1 blast furnace	10.00 to 10.50
Cast borings	11.00 to 11.50
Heavy axle turnings	15.00 to 15.50
No. 1 low phos. hvy.	21.00 to 21.50
Couplers & knuckles	21.00 to 21.50
Rolled steel wheels	21.00 to 21.50
Steel axles	21.50 to 22.00
Shafting	23.00 to 23.50
Spec. iron & steel pipe	16.50 to 17.00
Cast borings (chem.)	14.00 to 14.50

CHICAGO

Delivered to Chicago district consumers:

Per Gross Ton	
Hvy. mltng. steel	\$15.50 to \$16.00
Auto. hvy. mltng. steel alloy free	14.75 to 15.25
No. 2 auto steel	11.75 to 12.25
Shoveling steel	15.50 to 16.00
Factory bundles	15.00 to 15.50
Dealers' bundles	13.50 to 14.00
No. 1 busheling	14.50 to 15.00
No. 2 busheling, old	5.75 to 6.25
Rolled carwheels	18.25 to 18.75
Railroad tires, cut	18.75 to 19.25
Railroad leaf springs	18.25 to 18.75
Steel coup. & knuckles	18.25 to 18.75
Axle turnings	14.75 to 15.25
Coil springs	19.25 to 19.75
Axle turn. (elec.)	16.75 to 17.25
Low phos. punchings	19.25 to 19.75
Low phos. plates 12 in. and under	18.75 to 19.25
Cast iron borings	8.50 to 9.00
Short shov. turn.	9.75 to 10.25
Machine shop turn.	8.25 to 8.75
Rerolling rails	18.75 to 19.25
Steel rails under 3 ft.	18.75 to 19.25
Steel rails under 2 ft.	19.25 to 19.75
Angle bars, steel	17.75 to 18.25
Cast iron carwheels	17.00 to 17.50
Railroad malleable	18.25 to 18.75
Agric. malleable	14.25 to 14.75
Per Net Ton	
Iron car axles	21.50 to 22.00
Steel car axles	20.25 to 20.75
Locomotive tires	14.25 to 14.75
Pipes and flues	10.75 to 11.25
No. 1 machinery cast.	13.50 to 14.00
Clean auto. cast	13.75 to 14.25
No. 1 railroad cast	13.00 to 13.50
No. 1 agric. cast	11.25 to 11.75
Stove plate	8.75 to 9.25
Grate bars	9.25 to 9.75
Brake shoes	10.75 to 11.25

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$17.00 to \$17.50
No. 2 hvy. mltng. steel	16.00 to 16.50
Low phos. plate	20.00 to 20.50
No. 1 busheling	16.25 to 16.75
Hydraulic bundles	16.50 to 17.00
Machine shop turn.	11.00 to 11.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$16.50 to \$17.00
No. 2 hvy. mltng. steel	15.50 to 16.00
Comp. sheet steel	16.00 to 16.50
Light bund. stampings	13.50 to 14.00
Drop forge flashings	14.50 to 15.00
Machine shop turn.	9.50 to 10.00
Short shov. turn.	10.50 to 11.00
No. 1 busheling	15.25 to 15.75
Steel axle turnings	15.00 to 15.50
Low phos. billet and bloom crops	22.00 to 22.50
Cast iron borings	10.50 to 11.00
Mixed bor. & turn.	10.50 to 11.00
No. 2 busheling	10.50 to 11.00
No. 1 cupola cast	17.50 to 18.00
Railroad grate bars	14.00 to 14.50
Stove plate	14.00 to 14.50
Rails under 3 ft.	21.50 to 22.00
Rails for rolling	20.50 to 21.00
Railroad malleable	20.50 to 21.00

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	\$16.00 to \$16.50
No. 2 hvy. mltng. steel	14.00 to 14.50
Scrap rails	16.50 to 17.00
New hvy. b'ndled sheets	14.00 to 14.50
Old hydraulic bundles	12.50 to 13.00
Drop forge flashings	14.00 to 14.50
No. 1 busheling	14.00 to 14.50
Machine shop turn.	10.00 to 10.50
Shov. turnings	12.50 to 13.00
Mixed bor. & turn.	10.50 to 11.00
Cast iron borings	10.50 to 11.00
Knuckles & couplers	20.50 to 21.50
Coil & leaf springs	20.50 to 21.50
Rolled steel wheels	20.50 to 21.50
No. 1 machinery cast.	17.50 to 18.00
No. 1 cupola cast	16.50 to 17.00
Stove plate	14.50 to 15.00
Steel rails under 3 ft.	21.50 to 22.00
Cast iron carwheels	17.50 to 18.00
Railroad malleable	19.00 to 19.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting	\$14.75 to \$15.25
No. 1 hvy. melting	14.00 to 14.50
No. 2 hvy. melting	13.50 to 14.00
No. 1 locomotive tires	15.75 to 16.25
Misc. stand. sec. rails	15.50 to 16.00
Railroad springs	17.00 to 17.50
Bundled sheets	10.00 to 10.50
No. 1 busheling	13.50 to 14.50
Cast bor. & turn.	5.00 to 5.50
Machine shop turn.	6.50 to 7.00
Heavy turnings	10.50 to 11.00
Rails for rolling	17.50 to 18.00
Steel car axles	18.00 to 18.50
No. 1 RR wrought	10.25 to 10.75
No. 2 RR wrought	13.50 to 14.00
Steel rails under 3 ft.	18.50 to 19.00
Steel angle bars	15.50 to 16.00
Cast iron carwheels	17.00 to 17.50
No. 1 machinery cast.	16.75 to 17.25
Railroad malleable	16.00 to 16.50
Breakable cast	14.00 to 14.50
Stove plate	10.50 to 11.00
Grate bars	10.00 to 10.50
Brake shoes	10.00 to 10.50

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel	\$13.00 to \$13.50
No. 2 hvy. mltng. steel	11.00 to 11.50
Scrap rails for mltng.	17.00 to 17.50
Loose sheet clippings	8.50 to 9.00
Hydrau. b'ndled sheets	12.50 to 13.00
Cast iron borings	4.00 to 4.50
Machine shop turn.	5.00 to 5.50
No. 1 busheling	9.50 to 10.00
No. 2 busheling	3.00 to 3.50
Rails for rolling	18.50 to 19.00
No. 1 locomotive tires	14.50 to 15.00
Short rails	20.00 to 20.50
Cast iron carwheels	15.00 to 15.50
No. 1 machinery cast.	16.50 to 17.00
No. 1 railroad cast	14.50 to 15.00
Burnt cast	8.00 to 8.50
Stove plate	8.00 to 8.50
Agric. malleable	13.00 to 13.50
Railroad malleable	16.00 to 16.50
Mixed hvy. cast	14.00 to 14.50

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting steel	\$15.00
No. 2 hvy. melting steel	14.00
No. 1 busheling	13.00
Scrap steel rails	15.00
Steel rails under 3 ft.	16.00

Rails for rolling	16.50
Long turnings	5.00
Cast iron borings	7.50
Stove plate	11.00
Steel axles	20.00
No. 1 RR wrought	14.00
No. 1 cast	15.00
No. 2 cast	11.00
Cast iron carwheels	13.00
Steel car wheels	16.00

DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. industrial steel	\$13.00 to \$13.50
No. 2 hvy. mltng. steel	12.00 to 12.50
Borings and turnings	7.00 to 7.50
Long turnings	6.50 to 7.00
Short shov. turnings	8.50 to 9.00
No. 1 machinery cast.	13.50 to 14.00
Automotive cast	15.00 to 15.50
Hvy. breakable cast.	10.50 to 11.00
Stove plate	9.00 to 9.50
Hydraulic comp. sheets	13.75 to 14.25
New factory bushel.	12.50 to 13.00
Sheet clippings	8.75 to 9.75
Flashings	12.00 to 12.50
Low phos. plate scrap	13.75 to 14.26

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel	\$13.50 to \$14.00
No. 2 hvy. mltng. steel	12.00 to 12.50
Hvy. breakable cast.	14.00
No. 1 machinery cast.	16.00 to 16.50
No. 2 cast	13.50 to 13.00
Stove plate	10.50 to 11.00
Steel car axles	19.00 to 20.00
Shafting	19.00 to 20.00
No. 1 RR wrought	14.00 to 15.00
No. 1 wrought long	12.50 to 13.00
Spec. iron & steel pipe	13.50 to 14.00
Rails for rolling	19.00 to 20.00
Clean steel turnings*	7.00
Cast borings*	6.00 to 6.25
No. 1 blast furnace	6.00 to 6.25
Cast borings (chem.)	Nominal
Unprepared yard scrap	7.50 to 8.00
Light iron	5.00 to 5.50
Per gross ton, delivered local foundries:	
No. 1 machin. cast.	\$17.50 to \$19.25
No. 2 cast	16.50 to 17.00

* \$1.50 less for truck loads.

BOSTON

Dealers' buying prices per gross ton on cars:

Breakable cast	\$12.65
Machine shop turn.	6.00
Mixed bor. & turn.	\$4.50 to 5.15
Bun. skeleton long	8.50 to 8.90
Shafting	17.00 to 17.25
Stove plate	9.75 to 10.00
Cast bor. chemical	8.00 to 8.50
Per gross ton delivered consumers' yards:	
Textile cast	\$17.00 to \$19.00
No. 1 machine cast	17.00 to 19.00
Per gross ton delivered dealers' yards:	
No. 1 hvy. mltng. steel	\$13.00
No. 2 steel	12.00

PACIFIC COAST

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel	\$16.00
No. 2 hvy. mltng. steel	15.00

CANADA

Dealers' buying prices at these yards, per gross ton:

Toronto Montreal	
Low phos. steel	\$11.50 \$11.00
No. 1 hvy. mltng. steel	11.00 10.50
No. 2 hvy. mltng. steel	9.75 9.25
Mixed dealers steel	8.75 8.25
Drop forge flashings	9.75 9.25
New loose clippings	8.75 8.25
Busheling	5.50 5.00
Scrap pipe	7.75 7.25
Steel turnings	6.50 6.00
Cast borings	6.00 5.50
Machinery cast	17.00 to 16.50
Dealers' cast	16.00 to 15.50
Stove plate	12.00 to 11.50

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges	
No. 1 hvy. mltng. steel	\$14.00 to \$14.50
No. 2 hvy. mltng. steel	12.00 to 12.50
No. 2 cast	12.50 to 13.00
Stove plate	10.50

Boston on cars at Army Base or Mystic Wharf

No. 1 hvy. mltng. steel	\$15.00
No. 2 hvy. mltng. steel	14.00
Rails (scrap)	\$15.00 to 15.25
Stove plate	8.00 to 8.50

Philadelphia, delivered alongside boats, Port Richmond.

No. 1 hvy. mltng. steel	Nominal
No. 2 hvy. mltng. steel	Nominal

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

Steel prices on these pages are base prices only and f.o.b. mill unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases the amount of freight which must be absorbed in order to meet competition

SEMI-FINISHED STEEL

Billets, Blooms and Slabs
Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are \$2 higher. F.o.b. Duluth, billets only, \$2 higher.

Per Gross Ton
Rerolling\$34.00
Forging quality 40.00

Sheet Bars
Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

Per Gross Ton
Open hearth or bessemer\$34.00

Skelp
Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

Per Lb.
Grooved, universal and sheared1.90c.

Wire Rods
(No. 5 to 9/32 in.)

Per Lb.
Pittsburgh, Chicago or Cleveland 2.00c.
Worcester, Mass. 2.10c.
Birmingham 2.00c.
San Francisco 2.45c.
Galveston 2.25c.
9/32 in. to 47/64 in. \$3 a net ton higher. Quantity extras apply.

SOFT STEEL BARS

Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham 2.15c.
Detroit, delivered 2.25c.
Duluth 2.25c.
Philadelphia, delivered 2.47c.
New York 2.49c.
On cars dock Gulf ports..... 2.50c.
On cars dock Pacific ports..... 2.75c.

RAIL STEEL BARS

(For merchant trade)
Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham 2.15c.
On cars dock Tex. Gulf ports.. 2.50c.
On cars dock Pacific ports.... 2.75c.

BILLET STEEL REINFORCING BARS

(Straight lengths as quoted by distributors)
Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt. 2.15c.
Detroit, delivered 2.25c.
On cars dock Tex. Gulf ports.. 2.50c.
On cars dock Pacific ports.... 2.50c.

RAIL STEEL REINFORCING BARS

(Straight lengths as quoted by distributors)
Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham 2.15c.
Detroit, delivered 2.25c.
On cars dock Tex. Gulf ports.. 2.50c.
On cars dock Pacific ports.... 2.50c.

IRON BARS

Chicago and Terre Haute..... 2.15c.
Pittsburgh (refined) 3.75c.

COLD FINISHED BARS AND SHAFTING*

Pittsburgh, Buffalo, Cleveland, Chicago, and Gary 2.65c.
Detroit 2.70c.

* In quantities of 20,000 to 30,999 lb.

PLATES

Base per Lb.
Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del. 2.10c.

Philadelphia, del'd 2.15c.
New York, del'd 2.29c.
On cars dock Gulf ports..... 2.45c.
On cars dock Pacific ports..... 2.60c.
Wrought iron plates, P'tg.... 3.80c.

FLOOR PLATES

Pittsburgh or Chicago 3.35c.
New York, del'd 3.71c.
On cars dock Gulf ports 3.70c.
On cars dock Pacific ports.... 3.95c.

STRUCTURAL SHAPES

Base per Lb.
Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham 2.10c.
Philadelphia, del'd 2.215c.
New York, del'd 2.27c.
On cars dock Gulf ports..... 2.45c.
On cars dock Pacific ports.... 2.70c.

STEEL SHEET PILING

Base per Lb.
Pittsburgh, Chicago or Buffalo 2.40c.
On cars dock Gulf ports..... 2.85c.
On cars dock Pacific ports.... 2.90c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill
Standard rails, heavier than 60 lb., per gross ton.....\$40.00
Angle bars, per 100 lb. 2.70

F.o.b. Basing Points
Light rails (from billets) per gross ton\$40.00
Light rails (from rail steel) per gross ton 39.00

Base per Lb.
Cut spikes 3.00c.
Screw spikes 4.55c.
Tie plates, steel 2.15c.
Tie plates, Pacific Coast ports. 2.25c.
Track bolts, to steam railroads 4.15c.
Track bolts to jobbers, all sizes (per 100 counts) 65-5

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa., Buffalo; on spikes alone, Youngstown, Lebanon, Pa., Richmond, Va.

SHEETS

Hot Rolled

Base per Lb.
Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago 2.10c.
Detroit, delivered 2.20c.
Philadelphia, delivered 2.27c.
Granite City 2.20c.
On cars dock Pacific ports..... 2.60c.
Wrought iron, Pittsburgh 4.10c.

Cold Rolled*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago 3.05c.
Detroit, delivered 3.15c.
Granite City 3.15c.
Philadelphia, delivered 3.37c.
On cars dock Pacific ports..... 3.65c.

* Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base.

Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham 3.50c.
Philadelphia, del'd 3.67c.
Granite City 3.60c.
On cars dock Pacific ports.... 4.00c.
Wrought iron, Pittsburgh 6.10c.

Electrical Sheets (F.o.b. Pittsburgh)

Base per Lb.
Field grade 3.20c.
Armature 3.55c.
Electrical 4.05c.
Motor 4.95c.
Dynamo 5.65c.
Transformer 72 6.15c.
Transformer 65 7.15c.
Transformer 58 7.65c.
Transformer 52 8.45c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

Long Ternes

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary.... 3.80c.
F.o.b. cars dock Pacific ports. 4.50c.

Vitreous Enameling Stock, 20 Gage*
Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland 3.35c.
Detroit, del'd 3.45c.
Granite City 3.45c.
On cars dock Pacific ports.... 3.95c.

TIN MILL PRODUCTS

Tin Plate

Per Base Box
Standard cokes, Pittsburgh, Chicago and Gary (100 lb.).....\$5.00
Standard cokes, Granite City (100 lb.) 5.10

Special Coated Manufacturing Ternes
Per Base Box
Granite City\$4.40
Pittsburgh or Gary 4.30

Roofing Terne Plate
(F.o.b. Pittsburgh per Package, 112 sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	\$6.00	\$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

Black Plate, 29 gage and lighter*
Pittsburgh, Chicago and Gary 3.05c.
Granite City 3.15c.
On cars dock Pacific ports, boxed 4.00c

* Black plate base price applies to 29 gage within certain width and length limitations.

HOT ROLLED STRIP

(Widths up to 12 in.)

Base per Lb
Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham 2.10c.
Detroit, delivered 2.20c.
On cars dock Pacific ports..... 2.70c.
Cooperage Stock
Pittsburgh & Chicago 2.20c.

COLD ROLLED STRIP*

Base per Lb
Pittsburgh, Youngstown or Cleveland 2.80c.
Chicago 2.90c.
Detroit, delivered 2.90c.
Worcester 3.00c.

* Carbon 0.25 and less.

Commodity Cold Rolled Strip
Pittsburgh, Youngstown, or Cleveland 2.95c.
Detroit, delivered 3.05c.
Worcester 3.35c.

COLD ROLLED SPRING STEEL

Pittsburgh and Cleveland Worcester
Carbon 0.26-0.50% 2.80c. 3.00c.
Carbon 0.51-0.75 4.30c. 4.50c.
Carbon 0.76-1.00 6.15c. 6.35c.
Carbon 1.01-1.25 8.35c. 8.55c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

To Manufacturing Trade	
	Per Lb.
Bright wire	2.60c.
Galvanized wire, base	2.65c.*
Spring wire	3.20c.

* On galvanizing wire to manufacturing trade, size and galvanizing extras are charged, the price Nos. 6 to 9 gage, inclusive, thus being 3.15c.

To the Trade	
	Base per Kcg
Standard wire nails	\$2.55
Coated nails	2.55
Cut nails, carloads	3.85

Base per 100 Lb.	
Annealed fence wire	\$3.05
Galvanized fence wire	3.30
Twisted barbless wire	3.40
Woven wire fence, 15½ gage and heavier base col.	67
Fence posts (carloads), base col.	69
Single loop bale ties, base col.	56
Stand. 2 pt., 12.5 gage barbed cattle wire, per 80 rod spool.	\$2.70
Stand. 2 pt., 12.5 gage barbed hog wire, per 80 rod spool.	\$2.88

Note: Birmingham base same on above items, except spring wire.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills
F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld		Wrought Iron	
In.	Black Galv.	In.	Black Galv.
1/8	56	1/8	56
1/4	59	1/4	59
3/8	63½	3/8	63½
1/2	66½	1/2	66½
3/4	68½	3/4	68½
1 to 3	68½	1 to 3	68½

Lap Weld		Wrought Iron	
In.	Black Galv.	In.	Black Galv.
2	61	2	61
2½	64	2½	64
3	66	3	66
4	68	4	68
5	70	5	70
6	72	6	72
8	76	8	76
10	80	10	80
12	84	12	84

Butt weld, extra strong, plain ends		Wrought Iron	
In.	Black Galv.	In.	Black Galv.
1/8	54½	1/8	54½
1/4	57½	1/4	57½
3/8	61½	3/8	61½
1/2	65½	1/2	65½
3/4	69½	3/4	69½
1 to 3	67	1 to 3	67

Lap weld, extra strong, plain ends		Wrought Iron	
In.	Black Galv.	In.	Black Galv.
2	59	2	59
2½	63	2½	63
3	66	3	66
4	68	4	68
5	70	5	70
6	72	6	72
8	76	8	76
10	80	10	80
12	84	12	84

On butt weld and lap weld steel pipe fobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount of \$4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or \$2 a ton higher, on all butt weld 8 in. and smaller.

Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. (Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

	Seamless		Lap Weld	
	Cold Drawn	Hot Rolled	Cold Drawn	Hot Rolled
1 in. o.d. 13 B.W.G.	\$ 9.01	\$ 7.82		
1½ in. o.d. 13 B.W.G.	10.67	9.26		
2 in. o.d. 13 B.W.G.	11.70	10.23		
2½ in. o.d. 13 B.W.G.	13.42	11.64		
3 in. o.d. 13 B.W.G.	15.03	13.04		
3½ in. o.d. 13 B.W.G.	16.76	14.54		
4 in. o.d. 12 B.W.G.	18.45	16.01		
4½ in. o.d. 12 B.W.G.	20.21	17.54		
5 in. o.d. 12 B.W.G.	21.42	18.59		
5½ in. o.d. 12 B.W.G.	22.48	19.50		
6 in. o.d. 11 B.W.G.	28.37	24.62		
6½ in. o.d. 10 B.W.G.	35.20	30.54		
7 in. o.d. 10 B.W.G.	43.04	37.35		
8 in. o.d. 9 B.W.G.	54.01	46.87		
9 in. o.d. 7 B.W.G.	82.93	71.96		

Extras for less carload quantities:

	Base
40,000 lb. or ft. over	5%
30,000 lb. or ft. to 39,999 lb. or ft.	10%
20,000 lb. or ft. to 29,999 lb. or ft.	15%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

CAST IRON WATER PIPE

Per Net Ton

*6-in. and larger, del'd Chicago.	\$54.50
6-in. and larger, del'd New York	52.20
*6-in. and larger, Birmingham.	46.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles.	52.00
F.o.b. dock, Seattle.	52.00
4-in. f.o.b. dock, San Francisco or Los Angeles	55.00
F.o.b. dock, Seattle.	52.00

Class "A" and gas pipe, \$3 extra 4-in. pipe is \$3 a ton above 6-in.

Prices for lots of less than 200 tons. For 500 tons and over, 6-in. and larger is \$45. Birmingham, and \$53.80 delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts:	
½ in. and 6 in. and smaller.	68½
Larger and longer up to 1 in.	66
1½ in. and larger	64
Lag bolts	66
Plow bolts, Nos. 1, 2, 3, and 7	68½
Hot pressed nuts, and c.p.c. and t-nuts, square or hex. blank or tapped:	
½ in. and smaller	67
9/16 in. to 1 in. inclusive	64
1½ in. to 1½ in. incl.	62
1½ in. and larger	60

On the above items with the exception of plow bolts, there is an additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts U.S.S. S.A.E.	
½ in. and smaller	67
9/16 to 1 in.	65
1½ in. and larger.	62

In full container lots, 10 per cent additional discount.

Stove bolts in packages, with nuts loose	72½
Stove bolts in packages, with nuts attached, add 15% extra.	
Stove bolts in bulk	83½
On stove bolts freight is allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.	

Large Rivets

(½ in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh, Cleveland Chicago, Birmingham

Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham ...65 and 10

Cap and Set Screws

(Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.)

Per Cent Off List

Milled hexagon head, cap screws, 1 in. dia. and smaller.	50 and 10
Milled headless set screws, cut thread ¼ in. and larger.	64
3/16 in. and smaller	73
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	70
Upset set screws, cup and oval points	75
Milled studs	52

Alloy Steel

Alloy Steel Blooms, Billets and Slabs
F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.
Base price, \$56.00 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.
Open-hearth grade, base. 2.70c.
Delivered, Detroit

2100 (1½% Nickel)	\$0.75
2300 (3½% Nickel)	1.55
2500 (5% Nickel)	2.25
31 Nickel-chromium	0.70
3200 Nickel-chromium	1.85
3300 Nickel-chromium	3.80
3400 Nickel-chromium	3.20
4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum) ..	0.55
4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum) ..	0.75
4340 Chr.-Ni.-Mo.	1.65
4345 Chr.-Ni.-Mo.	1.85
4600 Nickel - molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.) ..	1.10
5100 Chrome steel (0.60-0.90 Cr.) ..	0.35
5100 Chrome steel (0.80-1.10 Cr.) ..	0.45
6100 Chromium spring steel.	0.15
6100 Chromium-vanadium bar ..	1.20
6100 Chromium-vanadium spring steel	0.85
Chromium-nickel vanadium	1.50
Carbon-vanadium	0.35

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. base per lb. Delivered Detroit, 3.45c., carlots.

STAINLESS & HEAT RESISTANT ALLOYS

(Base prices, cents per lb. f.o.b. Pittsburgh)

Chrome-Nickel		No. 304	No. 302
Forging billets	21.25c.		20.40c.
Bars	25c.		24c.
Plates	29c.		27c.
Structural shapes.	25c.		24c.
Sheets	36c.		34c.
Hot-rolled strip	23.50c.		21.50c.
Cold-rolled strip	30c.		28c.
Drawn wire	25c.		24c.

Straight Chrome

No.	No.	No.	No.
410	430	442	446
Bars 18.50c. 19c.	22.50c.	27.50c.	27.50c.
Plates 21.50c. 22c.	25.50c.	30.50c.	30.50c.
Sheets 26.50c. 29c.	32.50c.	36.50c.	36.50c.
Hot stp. 17c. 17.50c.	24c.	35c.	35c.
Cold stp. 22c. 22.50c.	32c.	52c.	52c.

TOOL STEEL

High speed	67c.
High-carbon-chrome	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c a lb. higher.

British and Continental

BRITISH

Per Gross Ton
f.o.b. United Kingdom Ports

Ferromanganese, ex-port	Nominal
Tin plate, per base box	32s. to 33s.
Steel bars, open hearth.	13£ 9s.
Beams, open hearth.	12£ 2s. 6d.
Channels, open hearth.	12£ 2s. 6d.
Angles, open hearth.	12£ 2s. 6d.
Black sheets, No. 24 gage	17£ max.*; 17£ min.**
Galvanized sheets, No. 24 gage 19£ 10s. max.*; 19£ 10s. min.**	

* Empire markets only.

** Other than Empire markets.

CONTINENTAL

Per Gross Ton, Belgian Francs
f.o.b. Continental Ports

Bars, merchant	1500
Plates	1750
Joists	1475
Sheets, thin	1900

Above price are minimum base to which 100 francs should be added to cover war risk insurance, freight charges, etc.

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.	\$24.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	24.00
Delivered Brooklyn	26.50
Delivered Newark or Jersey City	25.53
Delivered Philadelphia	24.84
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	23.00
F.o.b. Buffalo	23.00
F.o.b. Detroit	23.00
Southern, delivered Cincinnati	23.06
Northern, delivered, Cincinnati	23.44
F.o.b. Duluth	23.50
F.o.b. Provo, Utah	21.00
Delivered, San Francisco, Los Angeles or Seattle	26.50
F.o.b. Birmingham*	19.38

* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

Basic

F.o.b. Everett, Mass.	\$23.50
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	23.50
F.o.b. Buffalo	22.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	22.50
Delivered Philadelphia	24.34
Delivered Canton, Ohio	23.89
Delivered Mansfield, Ohio	24.44
F.o.b. Birmingham	18.00

Bessemer

F.o.b. Buffalo	\$24.00
F.o.b. Everett, Mass.	25.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa.	25.00
Delivered Newark or Jersey City	26.53
Erie, Pa., and Duluth	24.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown	23.50
F.o.b. Birmingham	24.00
Delivered Cincinnati	24.11
Delivered Canton, Ohio	24.89
Delivered Mansfield, Ohio	25.44

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Buffalo	\$28.50
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Gray Forge

Valley or Pittsburgh furnace	\$22.50
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Charcoal

Lake Superior furnace	\$27.00
Delivered Chicago	30.34

Canadian Pig Iron

Per Gross Ton

Montreal	
Foundry iron	\$27.50 base
Malleable	28.00 base
Basic	27.50 base

Toronto

Foundry Iron	\$25.50 base
Malleable	26.00 base
Basic	25.50 base

On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.	
Per Gross Ton	
Domestic, 80% (carload)	\$100.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%	\$32.00
Domestic, 26 to 28%	39.50

Electric Ferrosilicon

Per Gross Ton Delivered; Lump Size

50% (carload lots, bulk)	\$69.50*
50% (ton lots, packed)	82.00*
75% (carload lots, bulk)	126.00*
75% (ton lots, packed)	142.00*

Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio

Per Gross Ton

10.00 to 10.50%	\$32.50
For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.	
For each unit of manganese over 2%, \$1 per ton additional.	
Base prices at Buffalo are \$1.25 a ton higher than at Jackson.	

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 5.00 to 5.50%	\$27.50
For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.	
The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed.	
Base prices at Buffalo are \$1.25 a ton higher than at Jackson.	
Manganese, each unit over 2%, \$1 a ton additional. Phosphorus 0.75% or over, \$1 a ton additional.	

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots, Lump Size, on Contract

4 to 6% carbon	\$11.00c.*
2% carbon	17.50c.*
1% carbon	18.50c.*
0.10% carbon	20.50c.*
0.06% carbon	21.00c.*

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon	\$98.00
2.50% carbon	103.00
2% carbon	108.00
1% carbon	118.00

Other Ferroalloys

Ferrotungsten, per lb. contained W del. carload	\$2.00
Ferrotungsten, 100 lbs. and less	2.25
Ferrovanadium, contract, per lb. contained V., delivered	\$2.70 to \$2.90†
Ferracolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., ton lots	\$2.25†
Ferrocobaltitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton	\$142.50
Ferrocobaltitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton	\$157.50
Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with \$3 unitage, freight equalized with Rockdale, Tenn., per gross ton	\$58.50
Ferrophosphorus, electrolytic 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, \$3 unitage, freight equalized with Nashville	\$75.00
Ferromolybdenum, per lb. Mo. f.o.b. furnace	95c.
Calcium molybdate, per lb. Mo. f.o.b. furnace	80c.
Molybdenum oxide briquettes 48-52% Mo. per lb. contained Mo. f.o.b. Langeloth, Pa.	80c.

* Spot prices are \$5 per ton higher.
† Spot prices are 10c. per lb. of contained element higher.

*ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton	
Old range, bessemer, 51.50%	\$5.25
Old range, non-bessemer, 51.50% ..	5.10
Mesaba, bessemer, 51.50%	5.10
Mesaba, non-bessemer, 51.50% ..	4.95
High phosphorus, 51.50%	4.85

Foreign Ores*

C.i.f. Philadelphia or Baltimore, Exclusive of Duty

Per Unit

Algerian, low P, Cu free, dry, 55 to 58% Fe	12c.
Swedish, low P, 68% Fe	12c.
Swedish, basic or foundry, 65% Fe	11c.
Caucasian, washed, 52% Mn	49c.
African, Indian, 44 to 48% Mn	46c.
African, Indian, 49 to 51% Mn	48c.
Brazilian, 46 to 48% Mn	46c.
Cuban, del'd, duty free, 51% Mn	61c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered	\$23.00 to \$24.00
Tungsten, domestic, scheelite delivered	23.00 to 25.00
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton; South African (low grade)	\$19.00
Rhodesian, 45%	22.00
Rhodesian, 48%	26.00 to \$27.00
Turkish, 48-49%	27.00 to 28.00
Turkish, 45-46%	25.00 to 26.00
Turkish, 40-41%	22.00
Chrome concentrates c.i.f. Atlantic Seaboard, per gross ton	
Turkish, 48-49%	\$27.00 to \$28.00

* All foreign ore prices are nominal

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	\$21.00
Domestic, f.o.b. Ohio River landing barges	21.00
No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines	\$20.00 to 22.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	\$25.00 to \$25.50
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2 1/2% silicon, f.o.b. Illinois and Kentucky mines	\$31.00
ditto, in bags, f.o.b. same mines	\$32.60

FUEL OIL

Per Gal.

No. 3, f.o.b. Bayonne, N. J.	5.10c.
No. 6, f.o.b. Bayonne, N. J.	3.57c.
No. 5 Bur. Stds., del'd Chicago	3.25c.
No. 6 Bur. Stds., del'd Chicago	2.75c.
No. 3 distillate, del'd Cleve'd.	5.25c.
No. 4 industrial, del'd Cleve'd.	5.00c.
No. 5 industrial, del'd Cleve'd.	4.25c.
No. 6 industrial, del'd Cleve'd.	3.875c.

COKE

Per Net Ton

Furnace, f.o.b. Connells-ville, Prompt	\$4.00 to \$4.25
Foundry, f.o.b. Connells-ville, Prompt	5.25 to 5.50
Foundry, by - product Chicago ovens	10.50
Foundry, by - product del'd New England	12.50
Foundry, by - product del'd Newark or Jersey City	11.38 to 11.90
Foundry, by - product Philadelphia	11.13
Foundry, by - product delivered Cleveland	11.05
Foundry, by - product delivered Cincinnati	10.50
Foundry, Birmingham	7.50
Foundry, by - product del'd St. Louis industrial district	10.75 to 11.00
Foundry, from Birmingham, f.o.b. cars dock Pacific ports	14.75

IRON AND STEEL WAREHOUSES

PITTSBURGH*

	Base per Lb.
Plates	3.40c.
Shapes	3.40c.
Soft steel bars and small shapes	3.35c.
Reinforcing steel bars	2.70c.
Cold finished bars and screw stock	3.65c.
Hot rolled strip	3.60c.
Hot rolled sheets	3.35c.
Galv. sheets (24 ga.) 500 lb. to 1499 lb.	4.75c.
Wire, black, soft annealed	3.30c.
Wire, galv., soft	3.55c.
Track spikes (1 to 24 kegs)	3.60c.
Wire nails (in 100-lb. kegs)	2.80c.

On plates, structurals, bars, strip and hot rolled sheets, base applied to orders of 400 to 1999 lb. On reinforcing bars base applies to orders of less than one ton and includes switching and starting charge.

All above prices for delivery within the Pittsburgh switching district.

NEW YORK

	Base per Lb.
*Plates, 1/4 in. and heavier	3.76c.
*Structural shapes	3.75c.
*Soft steel bars, round	3.84c.
Iron bars, Swed. char-coal	9.50c.
**Cold-fin. shafting and screw stock:	
Rounds, squares, hexagons	4.09c.
Flats up to 12 in. wide	4.09c.
Cold-rolled strip soft and quarter hard	3.51c.
*Hot-rolled strip, soft O.H.	3.96c.
*Hot-rolled sheets (8-30 ga.)	3.58c.
**Galv. sheets (24 ga.)	5.23c.
Long ternes (24 ga.)	5.90c.
Cold-rolled sheets (20 ga.)	
Standard quality	4.60c.
Deep drawing	4.85c.
Stretcher leveled	5.10c.
SAE, 2300, hot-rolled	7.35c.
SAE, 3100, hot-rolled	5.90c.
SAE, 6100, hot-rolled annealed	8.75c.
SAE, 2300, cold-rolled	8.59c.
SAE, 3100, cold-rolled, annealed	8.19c.
*Floor plate, 1/4 in. and heavier	5.56c.
Standard tool steel	12.50c.
Wire, black, annealed	4.85c.
Wire, galv. (No. 9)	4.70c.
O. H. spring steel, flats	4.70c.
Common wire nails, per keg	3.50c.

*For lots 400 to 1999 lb.

**For lots less than 1500 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.55c.
Soft steel bars, rounds and angles	3.50c.
Soft steel squares, hexagons, channels and Tees	3.65c.
Hot rolled strip	3.60c.
Floor plates	5.15c.
Hot rolled sheets	3.35c.
Galvanized sheets	4.85c.
Cold rolled sheets	4.30c.
Cold finished carbon bars	3.75c.

Above prices are subject to deductions and extras for quantity and are f.o.b. consumer's plant within Chicago free delivery zone.

CLEVELAND

	Base per Lb.
Plates	3.40c.
Structural shapes	3.58c.
Soft steel bars	3.25c.
Cold-fin. bars (1500 lb., over)	3.75c.
Hot-rolled strip	3.50c.
Cold rolled sheets	4.05c.
Cold-finished strip	3.20c.
Galvanized sheets (No. 24)	4.72c.
Hot rolled sheets	3.35c.
Floor plates, 3/16 in. and heavier	5.18c.
Black ann'd wire, per 100 lb.	\$3.10
No. 9 galv. wire, per 100 lb.	3.50
Com. wire nails, base per keg	2.75
Hot rolled alloy steel (3100)	5.85c.
Cold rolled alloy steel (3115)	6.75c.

Prices shown on hot rolled bars, strip, sheets, shapes and plates are for 400 to 1999 lbs. Alloy steel, 1000 lb. and over; galvanized sheets, 150 to 1499 lb.; cold rolled sheets, 400 to 1499 lb.

ST. LOUIS

	Base per Lb.
Plates and structural shapes	3.47c.
Bars, soft steel (round and flats)	3.62c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	3.77c.
Cold fin. rounds, shafting, screw stock	4.02c.
Galv. sheets (24 ga.)	4.52c.
Hot rolled sheets	3.38c.
Galv. corrugated sheets, 24 ga. and heavier	4.57c.
Structural rivets	5.02c.

* No. 26 and lighter take special prices.

BOSTON

	Base per Lb.
Structural shapes, 3 in. and larger	3.85c.
Plates, 1/4 in. and heavier	3.85c.
Bars	3.88c.
Heavy hot rolled sheets	3.71c.
Hot rolled sheets	4.21c.
Hot rolled annealed sheets	4.61c.
Galvanized sheets	4.61c.
Cold rolled sheets	4.71c.
The following quantity differentials apply: Less than 100 lb., plus \$1.50 per 100 lb.; 100 to 399 lb. plus 50c.; 400 to 1999 lb. base; 2000 to 9999 lb. minus 20c.; 10,000 to 39,999 lb. minus 30c.; 40,000 lb. and over minus 40c.	

BUFFALO

	Base per Lb.
Plates	3.62c.
Floor plates	5.25c.
Struc. shapes	3.40c.
Soft steel bars	3.35c.
Reinforcing bars (20,000 lb. or more)	2.15c.
Cold-fin. flats, squares, rounds, and hex.	3.65c.
Hot-rolled sheets, 3/16 x 14 in. to 48 in. wide incl., also sizes No. 8 to 30 ga.	3.35c.
Galv. sheets (24 ga.)	4.70c.
Bands and hoops	3.82c.

NEW ORLEANS

	Base per Lb.
Mild steel bars	4.20c.
Reinforcing bars	3.24c.
Structural shapes	4.10c.
Plates	4.10c.
Hot-rolled sheets, No. 10	4.35c.
Steel bands	4.75c.
Cold-finished steel bars	5.10c.
Structural rivets	4.85c.
Boiler rivets	4.85c.
Common wire nails, base per keg	3.55
Bolts and nuts, per cent off list	60

REFRACTORIES PRICES

Fire Clay Brick

	Per 1000 f.o.b. Works
Super-duty brick, at St. Louis	\$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1 Ohio	39.90
Ground fire clay, per ton	7.10

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	\$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement per net ton (Eastern)	8.55

Chrome Brick

	Net per Ton
Standard f.o.b. Baltimore, Plymouth Meeting and Chester	\$50.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	50.00

Magnesite Brick

	Net per Ton
Standard f.o.b. Baltimore and Chester	\$72.00
Chemically bonded, f.o.b. Baltimore	61.00

Grain Magnesite

	Net per Ton
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	(—)*
Domestic, f.o.b. Baltimore and Chester in sacks	40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

* None available.

PHILADELPHIA

	Base per Lb.
*Plates, 1/4-in. and heavier	3.55c.
*Structural shapes	3.55c.
*Soft steel bars small shapes, iron bars (except bands)	3.85c.
†Reinforc. steel bars, square and deformed	2.76c.
Cold-finished steel bars	4.16c.
*Steel hoops	4.35c.
*Steel bands, No. 12 and 3/16 in. incl.	3.85c.
*Spring steel	5.00c.
*Hot-rolled anneal. sheets	3.55c.
†Galvanized sheets (No. 24)	4.75c.
*Diam. pat. floor plates, 1/4 in.	5.25c.

*For quantities between 400 and 1999 lb.

†For 10 bundles or over.

‡For one to five tons.

BIRMINGHAM

	Base per Lb.
Bars and bar shapes	3.50c.
Structural shapes and plates	3.55c.
Hot rolled sheets No. 10 ga.	3.35c.
Galvanized sheets No. 24 ga. or more	4.75c.
Strip	3.60c.
Reinforcing bars	3.50c.
Floor plates	5.88
Cold finished bars	4.43
Machine and carriage bolts	.50 & 10 off list
Rivets (structural)	\$4.60 base
On plates, shapes, bars, hot-rolled strip, heavy hot-rolled sheets, the base applies on 400 to 1999 lb. All prices are f.o.b. consumer plant.	

PACIFIC COAST

	San Francisco	Los Angeles	Seattle
Plates, tanks and U. M.	4.00c.	3.80c.	3.40c.
Shapes, standard	4.00c.	3.80c.	3.50c.
Soft steel bars	4.00c.	3.95c.	4.00c.
Reinforcing bars, f.o.b. cars dock			
Pacific ports	2.525c.	open.	2.975c.
Hot-rolled sheets (No. 10)	3.85c.	4.10c.	3.70c.
Galv. sheets (No. 24 and lighter)	5.15c.	5.00c.	4.75c.
Galv. sheets (No. 22 and heavier)	5.40c.	5.00c.	4.75c.
Cold-finished steel			
Rounds	6.80c.	6.60c.	7.00c.
Squares and hexagons	8.05c.	7.85c.	8.25c.
Flats	8.55c.	8.35c.	8.25c.
Common wire nails—base per keg less carload	3.25c.	3.25c.	3.15c.

All items subject to differentials for quantity.

ST. PAUL

	Base per Lb.
Mild steel bars, rounds	4.10c.
Structural shapes	4.00c.
Plates	4.00c.
Cold-finished bars	4.83c.
Hot-rolled annealed sheets, No. 24	4.75c.
Galvanized sheets, No. 24	5.00c.

On mild steel bars, shapes and plates the base applies on 400 to 14,999 lb. On hot-rolled sheets, galvanized sheets and cold-rolled sheets base applies on 15,000 lb. and over. Base on cold-finished bars is 1000 lb. and over of a size.

DETROIT

	Base per Lb.
Soft steel bars	3.43c.
Structural shapes	3.65c.
Plates	3.60c.
Floor plates	5.27c.
Hot-rolled sheets, 8 to 30 gages above 12 in. and 3/16 in. 24 in. to 48 in. wide	3.43c.
Cold-rolled sheets	4.50c.
*Galvanized sheets	4.84c.
Hot rolled strip, under 12 gage	3.68c.
Hot rolled strip, above 12 gage	3.43c.
Cold-finished bars	3.80c.
Cold-rolled strip	3.40c.
Hot-rolled alloy steel (SAE 3100 Series)	5.97c.
Cold-rolled alloy (SAE 2300)	8.45c.

Quantity extras apply to all items. *Price applies only in metropolitan Detroit.

THIS WEEK'S MACHINE ... TOOL ACTIVITIES ...

... Substantial purchases of machine tools by automotive industry raise level of domestic orders to level of foreign business, which shows signs of easing off . . . Fairly well diversified buying reported in some dealer centers . . . No improvement in deliveries seen.

Automotive Purchases Raise Domestic Totals

CINCINNATI—Fairly broad automobile purchasing during the past week brought the local machinery market upward to a level slightly better than obtained a fortnight ago. In fact, this ordering swelled the domestic demand to a proportion almost equal to that of the continued active foreign ordering. While precise details on orders were withheld by local manufacturers, it was learned that two auto companies purchased substantial amount of crankshaft turning equipment, which included several types of lathes. In addition to this, broaching, milling and grinding equipment also was listed among the week's automobile purchases. General domestic demand still appears to be at about the level as has obtained throughout the quarter, with heavy machinery builders receiving a fair proportion of the business. Drilling machinery continues to be reasonably active, while shapers and brakes show relatively no change.

Foreign demand, while still substantial, shows some signs of easing in the tools that had been most active heretofore. Manufacturers say that this is largely the result of efforts to straighten out contract situations and to improve the delivery situation.

Production is still running at a high peak.

Automotive Parts Plants Lining Up Equipment

CLEVELAND—Sales of single machine tools have improved in this immediate district during the past week. A local forge company distributed some business and is inquiring for additional machines while a down-state firm purchased lathes and radials. The several automotive parts plants at Toledo are working out programs in line with production requirements for next season which apparently will require more equipment than was purchased last year. Educational orders for 75-mm. shell casings have been received by Willys-Overland Motors, Inc., and are being made the basis for development of a skeleton department available for munitions in event of an emergency.

Further details on the automotive industry's experiments with plastics for large panels indicate that the injection molding system is being used at one plant

at least and that rear door panels are being made over a base of ordinary cardboard with cardboard supports.

Buying for 1941 Auto Production About to Start

DETROIT—Enlivened interest in machine tools is indicated by the multiplicity of inquiries which have been made, or will shortly be made in Detroit. Most units of the automobile industry have indicated that their 1941 programs are ready to be launched. Chrysler is believed to be preparing to make heavy expenditures and, at the same time, at least the Chevrolet division of General Motors is known to be under way on a program of importance. This is typical of the February pattern of business in the Detroit territory; it is the start of the "big drive" for next year's automotive production. An important percentage of farming implements and special equipment required for the new Ford tractors will be manufactured under contract by the B. F. Avery & Co. at Louisville, Ky., it has been learned. In a minor way, production of the equipment has already been started.

Mixed Sales Trends Seen In Chicago District

CHICAGO—The volume of business during January was well under that of the previous month, which in most sales offices here was one of the banner months of 1939. In one large office February to date is already 20 per cent ahead of January's total bookings. Of importance is the fact that this fine February showing can be attributed entirely to good individual distribution.

Production equipment ordered by Nash for a new light car at Kenosha, Wis., provided the greatest single boost to the January record. Most of the machine tools in this program are said to have been purchased.

Deliveries apparently are unimproved. It is again being heard that small buyers are dubious of sellers' statements that prompt deliveries are difficult to obtain. Many of the occasional openings on builders' schedules that existed up to only a few weeks ago are now closed, and orders even for single standard machines can not be shipped in some cases for from six months to a year. Under current con-

ditions, dealers point to the need for the occasional buyer of single machine tools to plan his purchasing at least six months in advance. Those plants which today are not solidly booked may become so shortly.

New Aircraft Business Expected

NEW YORK—Issuance of further large scale orders on the part of the aircraft engine industry has yet to materialize, following conferences with the machine tool industry establishing priority of deliveries to the aircraft industry. It is believed that after settlement of details a great deal more business will be placed, amounting to perhaps \$10,000,000 worth of equipment from engine plants in the East. Dealers have been excluded from conferences held both here and in Washington and hence are in the dark as to what promises their principals have made, but it is apparent that delivery promises to other domestic buyers will not be unduly extended. As it is, deliveries are now running six to eight months after receipt of order, with some large size machines, like horizontal boring mills, running a year ahead. Here and there exceptions are to be found. Low-cost lathes are still obtainable within a few weeks, for example. Meanwhile, both inquiries and orders from general industry have been more widely scattered in the past week and have been in better volume.

French, British Dealing With U. S. Manufacturers

CHICAGO—The Illinois Manufacturers' Association has warned its members not to deal through intermediaries or agents in connection with orders for their products by the British and French governments. Both missions are dealing directly with manufacturers, not through agents, the association said.

Polystyrene Price Reduced

A MAJOR price reduction in polystyrene plastic molding materials was announced recently by the plastics division of Monsanto Chemical Co., to be effective Feb. 7. The reduction amounts to 5c. a lb. on clear molding compound and 4c. a lb. on colored molding material.

New Warehouses In West

OAKLAND, Cal.—Herrick Iron Works has constructed a new steel frame warehouse and reinforcing steel fabricating shop here. Thompson-Diggs Co., distributor of heavy and domestic hardware has started construction of a \$100,000 all-steel warehouse at Sacramento.

Current Metal Working Activity

Latest Data Assembled by THE IRON AGE from Recognized Sources

Figures in italics are 11 months' totals

	January 1940	December 1939	November 1939	December 1938	12 Months 1939	12 Months 1938
Steel Ingots: (gross tons)						
Monthly output ^a	5,017,588	5,164,420	5,462,616	3,130,746	45,768,899	27,742,225
Average weekly output ^a	1,132,638	1,168,421	1,273,337	708,314	877,808	532,072
Per cent of capacity ^a	83.18	85.57	93.26	52.79	64.29	39.65
Pig Iron: (gross tons)						
Monthly output ^b	3,600,020	3,768,336	3,720,436	2,210,728	31,533,370	18,782,236
Raw Materials: (net tons)						
Coke output ^c		5,031,797	4,912,773	3,438,445	44,425,123	32,495,800
Lake ore consumed ^d (gross tons)		5,538,374	5,477,969	3,040,700	44,361,289	25,703,050
Scrap iron and steel consumed ^e		3,805,000	4,025,000	2,411,977	35,006,000	21,528,000
Castings: (net tons)						
Malleable, orders ^e		45,978	51,778	35,633	489,482	289,384
Steel, orders ^e				38,342		294,591
Finished Steel: (net tons)						
Trackwork shipments ^a		7,355	6,640	2,840	69,250	37,336
Fabricated shape orders ^f		84,383	99,316	163,445	1,305,049	1,256,639
Fabricated plate orders ^g		23,627	26,020	28,218	357,393	285,061
U. S. Steel Corp. shipments ^h		1,304,284	1,270,894	694,204	10,652,150	6,655,749
Fabricated Products:						
Automobile production ⁱ		462,500††	350,000††	388,346	3,725,000††	2,655,171
Steel furniture shipments ^e		\$2,159,729	\$2,142,154	\$1,982,023	\$22,609,168	\$20,355,973
Steel boiler orders ^e (sq. ft.)		553,796	802,033	891,926	11,098,316	4,199,442
Locomotives ordered ⁱ	28	127**	41	28**	415	228
Freight cars ordered ⁱ	209	4,381**	7,691	2,674**	56,915	16,539
Machine tool index ^j		93.3	91.2	*	70.0	*
Foundry equipment index ^k		164.8	192.2	141.8	196.5†	106.5†
Non-Ferrous Metals: (net tons, U. S. only)						
Lead shipments ^l		44,881	64,365	33,908	555,074	421,625
Lead stocks ^l		58,777	58,061	115,902		
Zinc shipments ^m	57,551	53,468	64,407	39,354	598,972	395,554
Zinc stocks ^m	65,602	65,995	61,522	126,769		
Tin deliveries ⁿ (gross tons)	9,780	11,366	7,870	3,400	71,896	50,660
Refined copper deliveries ^o		107,380‡	*	47,804	948,559	607,672
Refined copper stocks ^o		159,485	*	289,755	*	*
Exports: (gross tons)						
Total iron and steel ^p			605,555	490,095	5,475,992	4,658,041
All rolled and finished steel ^p			208,233	123,006	1,602,514	1,269,697
Semi-finished steel ^p			74,868	18,141	250,257	231,494
Scrap ^p			271,293	321,261	3,347,291	2,653,114
Imports: (gross tons)						
Total iron and steel ^p			15,216	28,767	300,452	235,783
Pig iron ^p			2,774	1,237	37,274	31,851
All rolled and finished steel ^p			4,398	12,744	153,361	142,761

†Three months' average. *Not available. ††Preliminary. **Includes yearly adjustments. ‡Five-months' average.

Source of data: ^aAmerican Iron and Steel Institute; ^bTHE IRON AGE; ^cBureau of Mines; ^dLake Superior Iron Ore Association; ^eBureau of the Census; ^fAmerican Institute of Steel Construction; ^gUnited States Steel Corp.; ^hPreliminary figures from Ward's Automotive Reports—Final figures from Bureau of the Census, U. S. and Canada; ⁱRailway Age; ^jFoundry Equipment Manufacturers Association; ^kAmerican Bureau of Metal Statistics; ^lAmerican Zinc Institute; ^mNew York Commodity Exchange; ⁿCopper Institute; ^oDepartment of Commerce; ^pBritish Iron and Steel Federation; ^rInstitute of Scrap Iron and Steel.

PLANT EXPANSION AND EQUIPMENT BUYING

◀ NORTH ATLANTIC ▶

Flintkote Co., 50 West 50th Street, New York, plans new branch plant near city limits of Meridian, Miss., for production of insulating board. It will consist of several one-story units with storage and distributing buildings, machine shop, power house and miscellaneous structures. Cost over \$1,500,000 with equipment.

S. H. Pomeroy Co., 280 East 184th Street, New York, manufacturer of metal windows, sash, etc., has arranged for purchase of five-story industrial building at Lincoln Avenue and East 133rd Street, Bronx, about 100,000 sq. ft., for main plant.

Commanding Officer, Ordnance Department, Watervliet Arsenal, Watervliet, N. Y., asks bids until Feb. 20 for bronze castings (Circular 442), steel tubing (Circular 450), milling fixtures, etc. (Circular 440); until Feb. 21 for 100 galvanized iron waste cans, with body of galvanized steel (Circular 456); until Feb. 23 for steel tool stands and drawers, and steel stools and cabinets (Circular 454); until Feb. 27 for one hardness testing machine (Circular 437).

General Aniline Works, Inc., 435 Hudson Street, New York, has let general contract to White Construction Co., 95 Madison Avenue, for four-story addition to plant at Grasselli, N. J., cost over \$65,000 with equipment.

Utica Knitting Co., 1712 Erie Street, Utica, N. Y., has approved plans for new steam-electric power plant at mill. Cost close to \$80,000 with equipment. Gibbs & Hill, Pennsylvania Station, New York, are consulting engineers.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Feb. 20 for one surface planer (Schedule 729), one milling and boring machine (Schedule 694), one slotter and keyseater machine (Schedule 711), seven hand planer and jointer machines (Schedule 730), all motor-driven, for Brooklyn Navy Yard; motor-driven centrifugal pumps and spare parts (Schedule 718), air filters and spare parts (Schedule 720) for Brooklyn and Philadelphia Navy yards; 34 pneumatic portable drills, 12 pneumatic chipping hammers, 20 pneumatic riveting hammers (Schedule 734), 26 portable electric drills and six portable electric hammers (Schedule 736), one retracting winch, one retrieving winch and spare parts (Schedule 704) for Philadelphia yard; until Feb. 23 for electric cable (Schedules 743 and 744) for Brooklyn and Philadelphia yards.

Casein Co. of America, Inc., 350 Madison Avenue, New York, a division of Borden Co., Inc., same address, has let general contract to Frank Lewis & Son, Bainbridge, N. Y., for one-story addition to plant at Bainbridge, 80 x 125 ft. Cost close to \$50,000 with equipment.

Quartermaster Supply Officer, Army Base, 58th Street and First Avenue, Brooklyn, asks bids until Feb. 20 for one two-man type, electric-operated paint spraying outfit (Circular 626-241); until March 1 for automatically-controlled water softeners (Circular 626-232).

Signal Corps Procurement District, Army Base, 58th Street and First Avenue, Brooklyn, asks bids until Feb. 21 for quantity of cap nuts for tuning outlets, dial gear units, switch shafts, outlet switch shafts, etc. (Circular 289).

Industrial Chromium & Engineering Co., 22 Murray Street, Newark, N. J., has purchased one-story industrial building at 7-11 Rome Street, and will occupy for plant.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until Feb. 19 for gages (Circular 1181), two assembling and crimping machines (Circular 1126); until Feb. 20 for 33,000 ft. of seamless steel tubing (Circular 1134).

Edward G. Budd Mfg. Co., Fox Street and Hunting Park Avenue, Philadelphia, has let general contract to Wark & Co., 1700 Sansom

Street, for one-story addition, 35 x 138 ft. Cost close to \$50,000 with equipment.

Central Iron & Steel Co., South Front Street, Harrisburg, Pa., has approved plans for one-story addition, 60 x 160 ft., for expansion in open hearth department. Award for structural steel framing has been let to Bethlehem Steel Co., Bethlehem, Pa. Cost over \$85,000 with equipment.

Metropolitan Edison Co., Reading, Pa., plans expansion and improvements in steam-electric generating plants at Reading and Lebanon, Pa. Cost estimated close to \$3,500,000 with equipment.

◀ BUFFALO DISTRICT ▶

Alpha Portland Cement Co., Easton, Pa., has let general contract to Burns Construction Co., Heffernan Building, Syracuse, N. Y., for one-story addition to branch mill at Jamesville, N. Y., for expansion in grinding department. Cost close to \$50,000 with equipment.

Elmira Coca-Cola Bottling Works, Inc., 411 West Second Street, Elmira, N. Y., has asked bids on general contract for new one and two-story mechanical-bottling works, 50 x 130 ft., and 70 x 70 ft. respectively, on site of present works. Cost over \$50,000 with equipment. Lucius White, Jr., 10 West Chase Street, Baltimore, is architect.

Comstock Canning Corp., East Pembroke, N. Y., plans rebuilding of three-story storage and distributing plant, 50 x 100 ft., recently destroyed by fire. Loss close to \$40,000 with equipment.

◀ NEW ENGLAND ▶

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for one 5-ton electric bridge crane for navy yard at Portsmouth, N. H. (Specifications 9707).

Electric Specialty Co., 211 South Street, Stamford, Conn., has let general contract to Vuono Construction Co., 217 Bedford Street, for two-story addition. Cost reported close to \$40,000 with equipment. E. W. Borggrafe, Stamford, is architect.

Chapman Valve Mfg. Co., Indian Orchard, Mass., has awarded contract to Ernest F. Carlson, Inc., 1694 Main Street, Springfield, Mass., for substructure for one-story machine shop, 150 x 300 ft. Cost over \$175,000 with equipment. Stone & Webster Engineering Corp., 49 Federal Street, Boston, is engineer.

Commanding Officer, Ordnance Department, Watertown Arsenal, Watertown, Mass., asks bids until Feb. 26 for 494 drive mechanisms and spare parts (Circular 364).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Feb. 20 for one 12,000-lb. capacity drop forge hammer, hand lever-operated (Schedule 700) for Boston Navy Yard; one motor-driven, two-spindle sensitive drill, sliding heads, with friction tapping attachments (Schedule 727) for Portsmouth, N. H., Navy Yard; until Feb. 23 for steel valves for boiler blow-off systems (Schedule 702), seamless steel tubing (Schedule 719) for Boston, Charleston and Puget Sound yards.

◀ WASHINGTON DIST ▶

Contracting Officer, Office of Chief of Engineers, Munitions Building, Washington, asks bids until Feb. 29 for 10 multiplex metal tables (Circular 104).

Quartermaster Depot, War Department, Washington, asks bids until Feb. 19 for two 80-kw. diesel oil engine-driven electric generating units (Circular 950-154).

General Purchasing Officer, Panama Canal, Washington, asks bids until Feb. 23 for one trenching machine, with conveyor, mounted on

crawlers, with alternate bids on two such machines (Schedule 3899), metal furniture, including steel kitchen tables, steel side tables, steel couches, etc. (Schedule 3893); until Feb. 26 for cast iron pipe bends, and coil chain (Schedule 3894).

National Retinning Co., 871 North Howard Street, Baltimore, affiliated with National Can Co., 811 South Wolfe Street, has let general contract to Kirson Construction Co., 339 St. Paul Street, for new one-story plant at 5401 Philadelphia Road. Cost over \$45,000 with equipment.

Commanding Officer, Ordnance Department, Ordnance Depot, Portsmouth, Va., asks bids until Feb. 23 for one motor-driven rip saw (Circular 39).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Feb. 20 for 15 aluminum or corrosion-resisting steel-jacketed steam kettles, each 40 gal. capacity (Schedule 741) for Sewall's Point, Va., yard; one steam anchor windlass, complete, with spare parts (Schedule 712) for Norfolk, Va., yard; rivets and washers (Schedule 634), one 14-in., motor-driven, heavy-duty engine lathe (Schedule 663), machine screws and nuts, and wood screws (Schedule 637); until Feb. 23 for rotary pumps (Schedule 584); until Feb. 27 for motor-driven engine lathe (Schedule 724), one steam cleaning machine (Schedule 747), one motor-driven turret lathe (Schedule 701), one motor-driven horizontal boring, milling and drilling machine and equipment (Schedule 707) for Eastern and Western Navy yards; until Feb. 23 for one motor-driven bench lathe (Schedule 735) for Baldwin yard.

◀ SOUTH ATLANTIC ▶

Carter Traveler Co., Gastonia, N. C., textile mill equipment, has let general contract to E. L. Quinn, Gastonia, for new two-story plant, 75 x 100 ft. Cost about \$45,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for one 5-ton electric bridge crane for Charleston, S. C., Navy Yard (Specifications 9683).

United States Engineer Office, Jacksonville, Fla., asks bids until Feb. 21 for three cast steel pump casings (Circular 391).

Clay County Electric Cooperative Association, Keystone Heights, Fla., plans extensions in power plant; cost about \$50,000. Financing has been arranged through Federal aid.

◀ SOUTHWEST ▶

Hyde Park Breweries Association, 2110 Salisbury Street, St. Louis, has let general contract to A. H. Haeseler Building & Contracting Co., 2346 Palm Street, for two-story storage and distributing building, 100 x 175 ft., at Twenty-first and Mallinckrodt Streets. Cost close to \$80,000 with equipment. W. A. Roebke, first noted address, is company engineer.

Gaylord Container Corp., Pulp and Paper Division, 2820 South Eleventh Street, St. Louis, plans expansion and improvements in kraft paper and paperboard mill at Bogalusa, La. Cost close to \$1,000,000 with machinery.

John Morrell & Co., foot of Quincy Street, Topeka, Kan., have awarded general contract to F. M. Spencer & Son, Eighth and Quincy Streets, for seven-story and basement addition, 102 x 109 ft. Cost close to \$200,000 with equipment. Henschien, Everds & Crombie, 59 East Van Buren Street, Chicago, are architects and engineers.

Board of Public Service, City Hall, St. Louis, asks bids until Feb. 20 for furnishing and installing ash-handling equipment and devices in new service building at city hospital No. 1.

McFadden & Menzie Packing Co., Iola, Kan., plans extensions and improvements in plant, cost over \$40,000 with equipment. Garrold A. Griffin, 501 Washington Street, is architect.

York Oil Field Supply Co., Inc., 1100 McCarty Street, Houston, Tex., will take bids soon on general contract for two one-story additions, 30 x 60 ft., to be equipped as a mechanical shop, and 30 x 40 ft., for general

operating department. Cost close to \$40,000 with equipment.

Vernon Meat Co., Vernon, Tex., will take bids soon on general contract for new two-story processing and packing plant. Cost over \$125,000 with equipment. Carl Schloemann, 6329 San Bonita Avenue, St. Louis, is consulting engineer.

◀ WESTERN PA. DIST. ▶

Westinghouse Electric & Mfg. Co., East Pittsburgh, will take bids soon for superstructure for one-story addition, 110 x 400 ft. Cost over \$125,000 with equipment. J. B. George is company engineer in charge.

Conn Welding & Machine Co., 115 North Diamond Street, New Castle, Pa., has let general contract to Charles McCombs, New Castle, for one-story addition, 40 x 100 ft. Cost close to \$40,000 with equipment.

Keystone Public Service Co., Drake Theater Building, Oil City, Pa., plans expansion in local steam-electric generating plant, including installation of new boiler unit with capacity of 100,000 lb. of steam per hr., and auxiliary equipment. Cost about \$250,000 with equipment. Work is scheduled to begin in March.

◀ SOUTH CENTRAL ▶

Knox Glass Bottle Co. of Mississippi, Pearl City, Jackson, Miss., plans one-story plant on Fannin Road, for manufacture of metal bottle caps. Cost close to \$45,000 with equipment.

Director of Purchases, Tennessee Valley Authority, Knoxville, Tenn., asks bids until Feb. 19 for steel towing track for Watts Bar Lock, totaling about 39,000 lb. of fabricated steel; until Feb. 21 for foundation steel for dams and derricks for navigation lock at Kentucky dam, totaling about 60,000 lb. of steel; until Feb. 23 for embedded lock gate anchorages for Kentucky dam, totaling 141,000 lb. of steel.

Standard Oil Co. of Louisiana, Inc., New Orleans, has let contract to W. Horace Williams Corp., New Orleans, for design and construction of new dock at oil refining plant, at Baton Rouge, 50 ft. wide and 1000 ft. long. Cost about \$900,000.

United States Engineer Office, Vicksburg, Miss., asks bids until Feb. 21 for 20,000 ft. of galvanized steel strand (Circular 157).

◀ OHIO AND INDIANA ▶

Lindsay Wire Weaving Co., 14025 Aspinwall Avenue, Cleveland, wire cloth, has let general contract to J. C. F. Shafer Co., Caxton Building, for two one-story T-shaped addition, about 40 x 120 ft. and 30 x 90 ft. Cost close to \$100,000 with equipment. Osborn Engineering Co., 7016 Euclid Avenue, is consulting engineer.

August Wagner & Sons Brewing Co., 605 South Front Street, Columbus, Ohio (George L. Lehle, 4554 North Broadway, Chicago, consulting engineer), plans expansion in branch plant at Chillicothe, Ohio, operated under name of Old Capital Brewing Co., including one-story addition to be equipped as a mechanical-bottling unit. Cost close to \$100,000 with equipment.

Barr Rubber Products Co., 1521 First Street, Sandusky, Ohio, will take bids soon for two one-story additions. Cost over \$50,000 with equipment.

Hudepohl Brewing Co., 40 East McMicken Avenue, Cincinnati, has let general contract to J. & F. Harig Co., 1425 Queen City Avenue, for two-story addition, 80 x 200 ft., to be equipped as a mechanical-bottling unit. Cost about \$150,000 with equipment. Felsberg & Gillespie, Ingalls Building, are architects.

Contracting Officer, Materiel Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until Feb. 19 for aluminum alloy gang channel nut assemblies (Circular 1039); until Feb. 20 for 24 electric furnaces, two tempering furnaces and seven electric ovens (Circular 1040), battery terminal stud wing nuts, fuel tank cap seal retainer springs, bracket assemblies, aircraft pilot's relief tube vertical brackets (Circular 1042); until Feb. 21 for interlocking fasteners, interlocking slider and pull, interlocking top stops, etc. (Circular 1048), four heat exchangers (Circular 1019); until Feb. 23

for socket wrench adapters, socket wrench bars, socket wrench handles, and sockets (Circular 1045); until Feb. 26 for valve control cable ferrules, suspension hook assemblies, control line hook assemblies, control cable stop beads, valve control cable buttons and other equipment (Circular 1049).

Coca-Cola Bottling Works, 1329 South Barr Street, Fort Wayne, Ind., will take bids soon on general contract for new one-story plant at Pontiac and Lillie Streets. Cost close to \$50,000 with equipment. Pohlmeier & Pohlmeier, Central Building, are architects.

◀ MICHIGAN DISTRICT ▶

Sutherland Paper Co., Kalamazoo, Mich., is arranging a 1940 expansion and improvement program at mill, including new production units for increased capacity. Cost close to \$500,000 with equipment.

Fruehauf Trailer Co., 16940 Harper Avenue, Detroit, motor trailers and parts, has let general contract to Collins Construction Co., Davidson Building, Kansas City, Mo., for new plant at Fruitland and Boyle Avenue, Vernon, Los Angeles, to supplement present works at 2160 East Twenty-fifth Street, Los Angeles. Cost about \$150,000 with machinery. H. L. Gogerty, 6272 Yuca Street, Hollywood, Cal., is architect.

Bruce Products Corp., 5712 Twelfth Street, Detroit, grinding and polishing wheels, metal-finishing equipment, etc., has let general contract to S. B. Wiggins, 4324 Leslie Street, for one-story addition to plant at Howell, Mich. Cost close to \$40,000 with equipment.

◀ MIDDLE WEST ▶

International Harvester Co., 180 North Michigan Avenue, Chicago, has plans maturing for new one-story branch plant at Dallas, Tex., where tract of land recently was acquired, consisting of a main one-story unit and smaller adjoining buildings. Work is scheduled to begin early in spring. Cost about \$350,000 with equipment.

Reliable Perforating Co., 2047 North Wood Street, Chicago, plans one-story addition. Cost close to \$40,000 with equipment. Joseph A. Nelson, 5248 North Glenwood Avenue, is architect.

Allen-Bradley Co., 1326 South Second Street, Milwaukee, plans eight-story addition at Greenfield Avenue and South Second Street. Negotiations are underway with city for amendment to zoning ordinance to permit erection. Cost over \$200,000 with equipment. Fitzhugh Scott, 724 East Mason Street, is architect.

United States Engineer Office, Fort Peck, Mont., asks bids until Feb. 20 for 12,000 ft. of plow steel wire rope (Circular 132).

Carlton County Co-operative Power Association, Kettle River, Minn., Thomas Ross, secretary, will take bids soon for new diesel power plant on local site. United Engineering Service, 1406 West Lake Street, Minneapolis, Minn., is consulting engineer.

United States Engineer Office, Commerce Building, St. Paul, Minn., asks bids until Feb. 21 for castings. Also for machine bolts, machine screws, five cutter blades, liner bolts, two steel plate suction hoods, vertical guide sheave bushings and other equipment (Circular 35).

City Council, Geneseo, Ill., plans new municipal power plant. Surveys and estimates of cost are being made. Warren & Van Praag, Decatur, Ill., are consulting engineers.

Northern States Power Co., 15 South Fifth Street, Minneapolis, Minn., plans addition to High Bridge steam-electric generating plant on waterfront at St. Paul, Minn., with installation of turbine-generator unit, high-pressure boiler and auxiliary equipment. Cost close to \$3,500,000.

◀ PACIFIC COAST ▶

Consolidated Aircraft Corp., 3302 Pacific Highway, San Diego, Cal., airplanes and parts, will take bids at once on general contract for group of seven additional buildings at plant. Structures will total about 450,000 sq. ft. of floor space. Cost close to \$1,000,000 with

equipment. Edward C. and Ellis W. Taylor, 803 West Third Street, Los Angeles, are architect and engineer respectively.

Bureau of Reclamation, Denver, Colo., asks bids until Feb. 20 for 616 anchor-jack assemblies for 13-ft. penstock at Boulder dam hydroelectric power station, Boulder Dam, Boulder Canyon project, Arizona-California-Nevada (Specification 1328-D); also until March 20 for station control equipment, switchgear and accessory apparatus for Grand Coulee hydroelectric power plant, Grand Coulee, Columbia Basin project, Wash. (Specification 893).

Seven-Up Bottling Co., Tucson, Ariz., Charles N. Clark, head, plans one-story plant on local site at Jacinto Street and Oracle Road, 50 x 115 ft. Cost about \$45,000 with equipment.

Harron, Rickard & McCone Co., 2205 Santa Fe Avenue, Los Angeles, machinery and mechanical equipment, has let general contract to Buttress & McClellan, 1013 East Eighth Street, for one-story addition, 80 x 260 ft. Cost over \$60,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Feb. 20 for one cut-off machine (Schedule 664), honing machine (Schedule 667), cut-off machine (Schedule 674), two milling machines (Schedule 665), drilling machine (Schedule 666), all motor-driven; five hardness testers (Schedule 680), three surface plates (Schedule 677) for naval air station, Alameda, Cal.; two tilting arbor screws, direct motor-driven (Schedule 669), 11,000 ft. of insulated electric cable (Schedule 668); until Feb. 23 for 160 steel lockers (Schedule 671) for Mare Island, Cal., Navy Yard; until March 1 for parts for airplanes (Schedules 900-3102 and 900-3120) for San Diego, Cal., Naval Air Station.

Constructing Quartermaster, San Francisco and vicinity, Fort Mason, Cal., asks bids until Feb. 29 for pumping plant for surface drainage at Hamilton Field, Cal. (Circular 6616-51).

◀ FOREIGN ▶

General Motors-Holdens, Ltd., Sydney, New South Wales, Australia, will convert a portion of one of its automobile plants for assembling of aircraft engines of Gipsy Major type. Parts will be made in a group of outside plants.

Transcontinental Paper Co., Ltd., 25 King Street, West, Toronto, Ont., has acquired site at Kapuskasing, Ont., for new pulp and paper mill, consisting of several one and multi-story units, with power house, pumping station, machine shop and other mechanical departments. Cost over \$500,000 with equipment.

Consumers Gas Co., 19 Toronto Street, Toronto, is receiving tenders, through Charles B. Dolphin, architect, 43 Victoria Street, for construction of one-story machine shop addition, 38 x 100 ft., at 36 Mutual Street.

Smith & Stone Electrical Mfg. Co., College View, Georgetown, Ont., has awarded structural steel contract to Hamilton Bridge Co., Ltd., Bay Street North, Hamilton, in connection with plant addition.

B. F. Goodrich Rubber Co., of Canada, Ltd., 521 King Street West, Kitchener, Ont., has awarded general contract to Dunker Construction Co., 251 King Street West, for plant addition.

Canadian Carborundum Co., Ltd., Stanley Street, Niagara Falls, Ont., has awarded reinforcing steel contract to Burlington Steel Co., Ltd., Sherman Street, Hamilton, for plant addition.

TRADE NOTES

The Consolidated Brush Corp., 5 E. 17th Street, New York City, has been acquired by the Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturers of electroplating equipment and supplies. Leo J. Springer, president of the brush corporation, has joined the Hanson-Van Winkle-Munning organization, and will specialize in the production of brushes, principally of the circular type. One of their important developments is a new design, a metal hub brush, which will have wide applications. Hanson-Van Winkle-Munning Company is installing extensive automatic equipment for producing these brushes.

Iron and Steel Exports (In Gross Tons)

	December		Twelve Months Ended December	
	1939	1938	1939	1938
Pig iron	18,912	20,622	177,024	432,851
Ferromanganese and spiegeleisen	1,066	3	2,923	247
Other ferroalloys	848	149	4,042	1,189
Scrap, iron and steel	204,298	321,261	3,551,589	2,974,375
Scrap, tin plate	1,531	1,749	16,706	17,128
Waste-waste tin plate	573	551	9,132	7,254
Pig iron, ferroalloys and scrap	227,228	344,335	3,761,416	3,433,044
Ingots, blooms, billets, sheet bars	47,995	10,197	167,171	159,930
Ingots, etc., alloy steel, incl. stainless	12,004	198	48,579	7,736
Skelp	11,817	7,439	81,693	59,686
Wire rods	6,820	307	31,450	22,283
Semi-finished steel	78,636	18,141	328,893	249,635
Bars, plain and reinforcing	38,501	11,264	192,977	141,448
Bars, alloy steel	2,819	2,393	14,619	7,954
Bars, stainless steel	50	117	296	668
Iron bars	119	37	865	1,315
Plates, plain and fabricated	30,043	20,373	258,375	220,169
Plates, alloy steel	71	58	2,114	3,095
Plates, stainless	32	17	154	277
Sheets, galvanized steel	11,817	7,279	104,430	72,343
Sheets, galvanized iron	854	229	6,538	3,691
Sheets, black, plain steel	26,432	23,428	264,120	200,625
Sheets, alloy steel	487	150	3,811	3,364
Sheets, stainless	124	60	1,094	1,290
Sheets, black iron	2,361	866	10,448	7,561
Hoops, bands, strips, plain steel	12,665	6,690	87,360	61,525
Hoops, bands, strip steel alloy	163	55	621	405
Hoops, bands, strip steel, stainless	44	62	975	616
Tin plate and taggers' tin	57,675	10,578	305,525	157,070
Terne plate (incl. long ternes)	447	307	5,492	4,395
Structural shapes, plain material	12,338	5,733	115,465	83,586
Structural material, fabricated	8,230	2,825	38,339	38,958
Sheet piling	607	104	7,692	3,494
Tanks, steel	4,997	2,228	28,734	37,731
Steel rails	6,441	4,999	59,092	82,721
Rail fastenings, switches, spikes, etc.	1,382	801	16,290	12,839
Boiler tubes	4,271	368	15,167	8,204
Casing and oil line pipe	17,920	4,940	98,124	71,083
Pipe, black and galvanized, welded steel	8,932	3,168	48,745	25,395
Pipe, black and galvanized, welded iron	1,970	832	8,613	5,792
Plain and galvanized wire	9,481	4,607	60,461	49,872
Barbed wire and woven wire products	7,581	3,429	58,632	37,481
Wire rope and other products	3,167	1,141	16,355	10,633
Nails and tacks	5,263	2,902	32,259	25,954
Bolts, nuts, rivets and washers except track	1,129	749	8,858	8,057
Other finished steel	2,579	217	10,866	3,092
Rolled and finished steel	280,992	123,006	1,883,506	1,392,703
Cast iron pipe and fittings	7,589	2,124	46,148	31,894
Malleable iron screwed fittings	633	304	4,608	3,093
Car wheels and axles	2,187	579	27,881	20,939
Castings, iron and steel	801	505	5,988	6,452
Castings, alloy steel, incl. stainless	55	246	1,385	1,154
Forgings, plain	2,029	671	14,591	8,237
Forgings, alloy steel, incl. stainless	287	54	2,013	855
Castings and forgings	13,581	4,483	102,614	72,624
Total	600,437	489,965	6,076,429	5,148,006

Iron and Steel Imports (In Gross Tons)

	December		Twelve Months Ended December	
	1939	1938	1939	1938
Pig iron	1,318	1,237	38,592	33,088
Sponge iron	176	83	1,879	519
Ferromanganese	1,285	4,333	33,415	21,125
Spiegeleisen	5,767	2,440	38,562	17,267
Ferrochrome	21	21	129	121
Ferrosilicon	108	251	1,602	530
Other ferroalloys	77	25	358	43
Scrap	1,267	6,519	29,492	24,151
Pig iron, ferroalloys and scrap	9,998	14,909	144,029	97,544
Steel ingots, blooms, etc.	4	16	16	204
Billets, whether solid or hollow	139	37	727	551
Wire rods	1,058	480	10,692	5,280
Semi-finished steel	1,201	517	11,435	6,035
Concrete reinforcement bars	317	317	2,365	1,532
Hollow steel bars	100	48	1,356	864
Merchant steel bars	504	1,854	17,061	18,898
Iron slabs	180	20	932	505
Iron bars	1	1	28	357
Boiler and other plate (including skelp)	2	34	1,406	6,045
Sheets, skelp, and saw plate	1	3	89	96
Die blocks or blanks, etc.	19	7	99	108
Tin plate, taggers' tin and terneplate	667	3,621	39,065	39,389
Structural shapes	16	281	7,785	3,621
Sashes and frames	515	4,462	5,879	5,879
Sheet piling	363	1,729	26,104	23,223
Rails and track material	265	2,143	16,545	17,439
Welded pipe	325	738	15,249	12,527
Other pipe	269	264	2,510	1,684
Cotton ties	1	11	8	27
Other hoops and bands	335	295	3,153	2,695
Barbed wire	106	114	1,664	2,020
Round iron and steel wire	8	73	1,481	1,459
Telegraph and telephone wire	171	677	7,310	7,600
Flat wire and steel strips	13	5	118	212
Wire rope and strand	24	324	324	428
Other wire	3,346	12,774	156,707	155,575
Nails, tacks, and staples	115	171	1,697	1,544
Bolts, nuts, and rivets	49	396	1,149	3,816
Horse and mule shoes				
Rolled and finished steel				
Malleable iron pipe fittings				
Cast iron pipe and fittings				
Castings and forgings				
Total	14,709	28,767	315,161	264,550

¹ Manganese content; ² chrome content; ³ silicon content; ⁴ alloy content.

Iron and Steel Imports Again Decline

WASHINGTON—For the third consecutive month, imports of iron and steel products into the United States registered a decline. Preliminary figures released by the Metals and Minerals Division of the Bureau of Foreign and Domestic Commerce report the December trade as totaling 13,442 gross tons valued at \$1,099,177 against November's 14,379 tons valued at \$1,005,774 and as compared with the trade of December 1938—22,248 tons valued at \$1,405,704.

The chief product imported in December in point of tonnage was spiegeleisen — 5767 tons — of which Canada supplied 5417 tons and Norway 350 tons. Pig iron receipts totaled 1318 tons, including 1185 tons from India and 133 tons from Canada, while Norway was the sole source of the 1285 tons of ferromanganese received and Sweden of all but one ton of the 1058 tons of wire rods imported.

During 1939 imports of iron and steel products into the United States totaled 285,669 tons valued at \$17,364,761 — up 19 per cent in quantity and 15.8 per cent in value over 1938 when this trade totaled 240,099 tons valued at \$15,000,483.

United States Imports of Pig Iron by Countries of Origin

	December		Twelve Months Ended December	
	1939	1938	1939	1938
United Kingdom	1,185	297	24,840	12,411
British India	150	6,473	14,236	2,656
Germany	133	790	6,862	...
Netherlands	...	...	...	...
Canada	...	...	...	...
France	...	...	...	...
Belgium	...	...	...	...
Norway	...	...	...	3,538
Sweden	...	...	261	205
Russia	...	...	...	...
All others	...	...	156	...
Total	1,318	1,237	38,592	33,088

December Imports of Iron and Manganese Ores

	Iron Ore		Manganese Concentrates, 35 Per Cent or Over	
	1939	1938	1939	1938
Canada	60	60	...	1
Cuba	10,500	21,000	8,463	9,318
Chile	97,300	139,800	...	...
Spain	...	...	...	...
Norway	4,331	14,034	...	...
Sweden	43,964	...	...	...
French Africa	...	...	...	...
Russia	...	...	10,447	9,797
India	...	...	7,804	537
Brazil	...	...	4,760	...
Gold Coast	6,520	...	13,694	10,143
Other countries	307	12,311	5,200	...
Total	162,982	187,205	50,368	29,796